

Depression and Anxiety Among Patients with COPD: A Nationwide Study from Lithuania

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Background: Chronic obstructive pulmonary disease (COPD) is frequently accompanied by depression and anxiety, which may exacerbate disease outcomes, reduce treatment adherence, and impair quality of life. Despite their clinical significance, these comorbidities remain frequently underdiagnosed and undertreated. This study examined the diagnosed prevalence of depression and anxiety, as well as the patterns of psychotropic medication use among patients with COPD in Lithuania.

Materials and Methods: A retrospective observational study was conducted using anonymized outpatient administrative data from the Lithuanian State Data Agency, comprising adult patients with COPD (ICD-10 J44.x) between 2020 and 2024. Mental health comorbidities were identified according to ICD-10 codes for anxiety disorders (F41.x), depressive episodes (F32.x), and recurrent depressive disorders (F33.x). Associations between categorical variables and sex differences were analyzed using contingency tables. Crude odds ratios (ORs) and adjusted odds ratios (aORs) from multivariable logistic regression analyses were calculated.

Results: Among 64,246 unique patients with COPD, 18.1% had a diagnosed psychiatric disorder, with a higher diagnosed prevalence among women than men (26.8% vs 12.1%; aOR = 2.40, 95% CI 2.32–2.48, $p < 0.001$). Anxiety disorders were identified in 15.0% of patients, and depressive disorders in 4.6%; women had significantly higher odds of depressive disorders compared with men (aOR = 3.53, 95% CI 3.36–3.72, $p < 0.001$). Psychotropic medications were prescribed to 61.9% of affected individuals, with women being more likely to receive any psychotropic medication than men (aOR = 0.687 for men vs women, 95% CI 0.644–0.732, $p < 0.001$). Anxiolytics represented 89.9% of all psychotropic prescriptions, with benzodiazepines accounting for 85.0% of this category. Family physicians were significantly more likely to prescribe anxiolytics than psychiatrists (OR = 10.66, $p < 0.001$). Antidepressant and neuroleptic prescribing showed statistically significant increasing trends over the study period ($p = 0.007$ and $p = 0.005$, respectively), whereas benzodiazepine prescribing rates also increased significantly ($p = 0.004$).

Conclusion: Anxiety and depression are common psychiatric comorbidities among patients with COPD in Lithuania and exhibit notable gender differences. Psychotropic medications were predominantly prescribed in primary care, with benzodiazepines accounting for the majority of anxiolytic treatments. These findings provide updated nationwide data on psychiatric comorbidity and psychotropic prescribing patterns among patients with COPD in Lithuania.

Keywords: chronic obstructive pulmonary disease, depression, anxiety, psychiatric comorbidity, psychotropic medications

Introduction

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable condition characterized by persistent respiratory symptoms and airflow limitation, most often resulting from long-term exposure to harmful particles or gases.¹ It affects approximately one-tenth of the global population and is projected to become the third leading cause of death worldwide by 2030.^{2,3} As the prevalence of COPD continues to rise, the burden of associated comorbidities is expected to increase accordingly.⁴ Given the growing emphasis on personalized and holistic approaches to chronic disease management, recognizing the impact of co-occurring conditions on prognosis and quality of life is essential.⁵ Patients with COPD frequently present with multiple chronic comorbidities, among which depression and anxiety are particularly common and clinically significant.^{6,7} The complex mechanisms underlying the relationship between COPD and mental health disorders include persistent symptom burden, physical limitations, social isolation, shared biological pathways, and

symptom overlap between respiratory and psychological conditions, all of which complicate diagnosis.⁸ These mental health conditions are associated with reduced functional capacity, lower quality of life, impaired self-management, and increased healthcare utilization.⁹ Although not directly related to pulmonary function, anxiety and depression significantly influence symptom perception, treatment adherence, exacerbation frequency, and mortality in COPD.^{10–12} The period between 2020 and 2024 was marked by substantial social and healthcare disruptions, including the COVID-19 pandemic, reduced access to care, and heightened psychological stress related to geopolitical instability, potentially amplifying mental health vulnerability among individuals with chronic respiratory disease.¹³ However, in Lithuania, national evidence on psychiatric comorbidity in COPD remains limited. Available data are largely derived from the period between 2012 and 2014 and were based on smaller-scale analyses, providing an incomplete picture of recent trends.¹⁴ To our knowledge, no nationwide study has simultaneously examined both psychiatric comorbidity prevalence and psychotropic prescribing patterns – including provider-level differences – among patients with COPD in Lithuania using contemporary administrative data. The present study addresses this gap by providing population-level evidence from 2020–2024, a period encompassing the COVID-19 pandemic and subsequent geopolitical disruptions, thereby allowing assessment of temporal trends during a uniquely challenging timeframe. Psychotropic prescribing patterns are of particular interest, as benzodiazepines – frequently used in primary care – carry risks of dependence, respiratory depression, and drug interactions that may be especially harmful in COPD patients. Therefore, this retrospective observational study was conducted to analyze the diagnosed prevalence of anxiety and depressive disorders and the patterns of psychotropic medication prescribing among patients with COPD in Lithuania, using nationwide administrative data from 2020 to 2024.

Methods

Data Source

This retrospective observational study used nationwide outpatient administrative healthcare data obtained from the Lithuanian State Data Agency (SDA). The study period extended from 1 January 2020 to 31 December 2024 and included patients with a documented diagnosis of COPD. All data were fully anonymized prior to analysis in accordance with national data protection legislation and the General Data Protection Regulation (GDPR). Data were accessed through the Lithuanian State Data Agency secure research environment under an authorized data use agreement. Only outpatient records were included; inpatient diagnoses and prescriptions were not captured in this dataset.

Study Population

The study population comprised individuals diagnosed with COPD, identified using ICD-10 codes: J44, J44.0, J44.1, J44.8, and J44.9. Within this cohort, individuals with psychiatric diagnoses (codes: F41, F32, F33) were also identified and included in further analysis. Records were obtained from ambulatory electronic medical records (EMRs) submitted by healthcare providers across Lithuania. Patients were identified using unique anonymized patient identifiers, and duplicate records across the study period were removed. Records with missing or contradictory values were excluded from the analysis; the remaining dataset comprised 64,246 unique patients.

Data Collection

Data were collected from healthcare facilities across Lithuania, including outpatient clinics, hospital-based outpatient departments, and primary care centers. Only outpatient healthcare records were included in the analysis. The dataset included demographic information (age and sex), clinical data, prescription records, and healthcare provider characteristics. In addition, data on prescribed psychotropic medications were analyzed. Psychotropic medication groups were classified according to Anatomical Therapeutic Chemical (ATC) codes: anxiolytics (N05B), benzodiazepines (N05BA, N05CD, N03AE), antidepressants (N06A), and neuroleptics (N05A). Psychotropic prescriptions were analyzed regardless of the temporal relationship to the psychiatric diagnosis, as the dataset did not allow for the precise determination of prescribing indication. The medical specialty of the prescribing physician (family physician or psychiatrist) was also recorded to evaluate differences in treatment practices. Data cleaning procedures were performed to ensure completeness and consistency.

Statistical Analysis

Descriptive statistics were used to summarize the characteristics of the study population. Group comparisons were conducted using the Chi-square test, and associations between categorical variables were evaluated with Pearson's Chi-square statistic. Crude odds ratios (ORs) were calculated using contingency table analyses. Multivariable logistic regression was performed to calculate adjusted odds ratios (aORs) with 95% confidence intervals (CIs), controlling simultaneously for sex, age, and calendar year. Annual trends in psychiatric comorbidity prevalence and psychotropic prescribing rates were assessed using linear regression (P for trend). A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using Python (version 3.12) within the Databricks analytics platform (Databricks Inc., San Francisco, CA, USA), utilizing the statsmodels package for logistic regression analyses and scipy.stats for trend analyses and contingency table calculations. Data organization and preparation were handled using Microsoft Excel 2016 (Microsoft Corp., Redmond, WA, USA; version 16.0).

Results

Between 2020 and 2024, a total of 64,246 unique patients in Lithuania were diagnosed with COPD. Of these, 11,608 (18.1%) had at least one recorded psychiatric diagnosis. COPD was identified in 38,063 men (59.2%) and 26,183 women (40.8%). Psychiatric diagnoses were more frequently recorded among women, accounting for 7017 cases (60.4% of all psychiatric cases), compared with 4591 cases among men (39.6%). The prevalence of psychiatric diagnoses among patients with COPD was significantly higher in women than in men (26.8% versus 12.1%, respectively; $p < 0.001$). Anxiety disorders were identified in 9615 patients (15.0%), including 5635 women (21.5%) and 3980 men (10.5%). Depressive disorders were diagnosed in 2983 patients (4.6%), of whom 2123 were women (8.1%) and 860 were men (2.3%). A total of 990 patients (8.5% of those with a psychiatric diagnosis) met the criteria for both anxiety and depressive disorders. After multivariable adjustment for age and calendar year, women with COPD had significantly higher odds of having a psychiatric diagnosis (aOR = 2.40, 95% CI 2.32–2.48, $p < 0.001$) as well as depressive disorders (aOR = 3.53, 95% CI 3.36–3.72, $p < 0.001$) (Table 1).

The prevalence of psychiatric comorbidity demonstrated a non-significant increase until 2022 followed by a decline in 2023–2024, with no statistically significant linear trend observed over the study period for either anxiety (P for trend = 0.284) or depression (P for trend = 0.238) (Figure 1).

In the analysis of pharmacological treatment patterns among patients with diagnosed psychiatric disorders, 7190 of 11,608 individuals (61.9%) received prescribed psychotropic medications. The proportion of patients receiving psychotropic medications increased significantly over the study period, rising from 50.4% in 2020 to 61.4% in 2024 (P for trend < 0.001) (Table 2).

Men had lower odds of receiving psychotropic medication than women (aOR = 0.687, 95% CI 0.644–0.732, $p < 0.001$). Among the 7190 treated patients, 5930 (82.5%) received prescriptions from family physicians, whereas 2333 (32.4%) received prescriptions from psychiatrists; 1091 patients (15.2%) received prescriptions from both provider

Table 1 Multivariable Logistic Regression Analysis of Factors Associated with Psychiatric Comorbidity Among Patients with COPD in Lithuania (2020–2024)

Variable	Adjusted OR	95% CI	p-value
Outcome: Any psychiatric diagnosis (anxiety or depressive disorder)			
Sex (Women vs Men)	2.40	2.32–2.48	<0.001
Age (per 1-year increase)	1.015	1.013–1.017	<0.001
Calendar year (per 1-year increase)	1.024	1.012–1.036	<0.001

Abbreviations: OR, odds ratio; CI, confidence interval. Women coded as reference category for sex comparison.

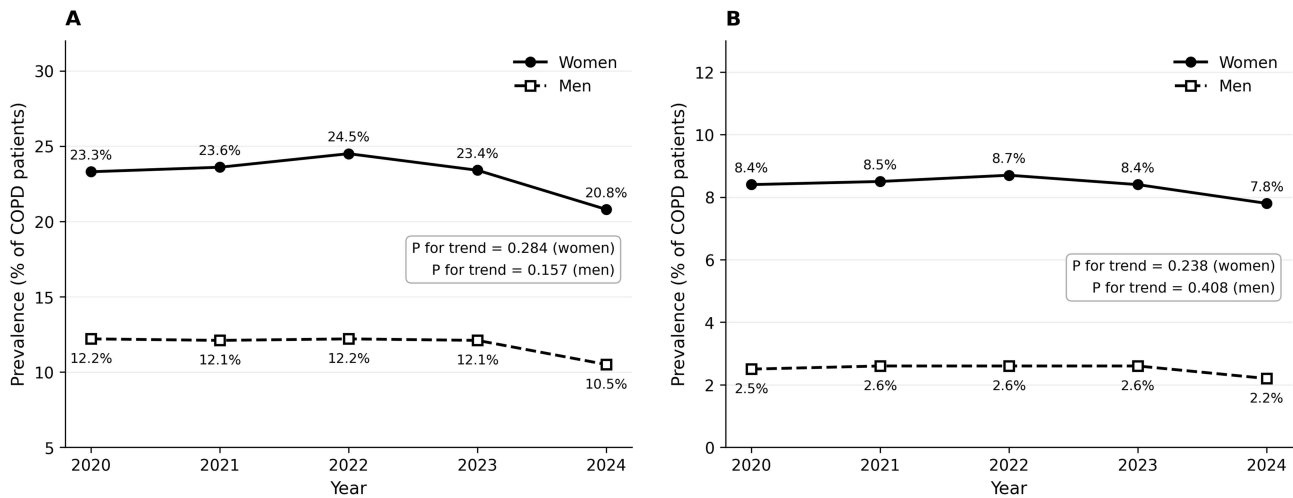


Figure 1 Annual diagnosed prevalence of psychiatric disorders among patients with COPD in Lithuania (2020–2024), stratified by sex. **(A)** Anxiety disorders. **(B)** Depressive disorders. Prevalence expressed as a percentage of total COPD patients per year. P for trend calculated using linear regression.

groups ($p < 0.001$). The likelihood of psychiatrist involvement in prescribing increased significantly over time (aOR = 1.04 per year, 95% CI 1.01–1.08, $p = 0.017$) (Figure 2).

A total of 6464 treated patients (89.9%) received anxiolytics, including 6113 (85.0%) who were prescribed benzodiazepines. Antidepressants and neuroleptics were prescribed to 2661 (37.0%) and 1840 (25.6%) treated patients, respectively. Prescribing patterns differed according to provider type. The crude odds of anxiolytic prescribing were 10.66 times higher among family physicians than among psychiatrists, while the crude odds of benzodiazepine prescribing were 9.85 times higher (both $p < 0.001$). For antidepressants and neuroleptics, the corresponding crude odds were 2.75-fold and 2.10-fold higher among psychiatrists than among family physicians (both $p < 0.001$). All psychotropic drug categories demonstrated statistically significant increases in annual prescribing rates over the study period (benzodiazepines P for trend = 0.004; antidepressants P for trend = 0.007; neuroleptics P for trend = 0.005) (Figures 3, 4 and Table 3).

Table 2 Annual Trends in Psychotropic Medication Prescribing Among COPD Patients with Psychiatric Diagnosis in Lithuania (2020–2024)

Year	Patients with psych. Dx (N)	Received Any Psychotropic (%)	Benzodiazepines (% of psych. Dx)	Antidepressants (% of psych. Dx)	Neuro-Leptics (% of psych. Dx)	Family Physician Only (%)	Psychiatrist Only (%)	Both Providers (%)
2020	2589	50.4%	40.0%	15.3%	9.4%	66.7%	15.8%	11.4%
2021	3099	53.0%	42.1%	17.0%	11.3%	60.8%	18.4%	13.5%
2022	3487	57.2%	44.2%	18.3%	12.4%	63.8%	19.0%	10.8%
2023	3558	58.9%	45.2%	19.1%	12.7%	65.9%	16.7%	11.0%
2024	3415	61.4%	46.0%	22.7%	15.1%	60.9%	21.3%	13.1%
P	—	<0.001*	0.004*	0.007*	0.005*	0.397	0.350	0.868

Notes: * $p < 0.05$, statistically significant linear trend. Percentages for benzodiazepine, antidepressant, and neuroleptic columns are calculated from all patients with a psychiatric diagnosis. Percentages for provider columns are calculated from patients who received any psychotropic medication. Some patients received prescriptions from both provider types.

Abbreviation: psych. Dx, psychiatric diagnosis.

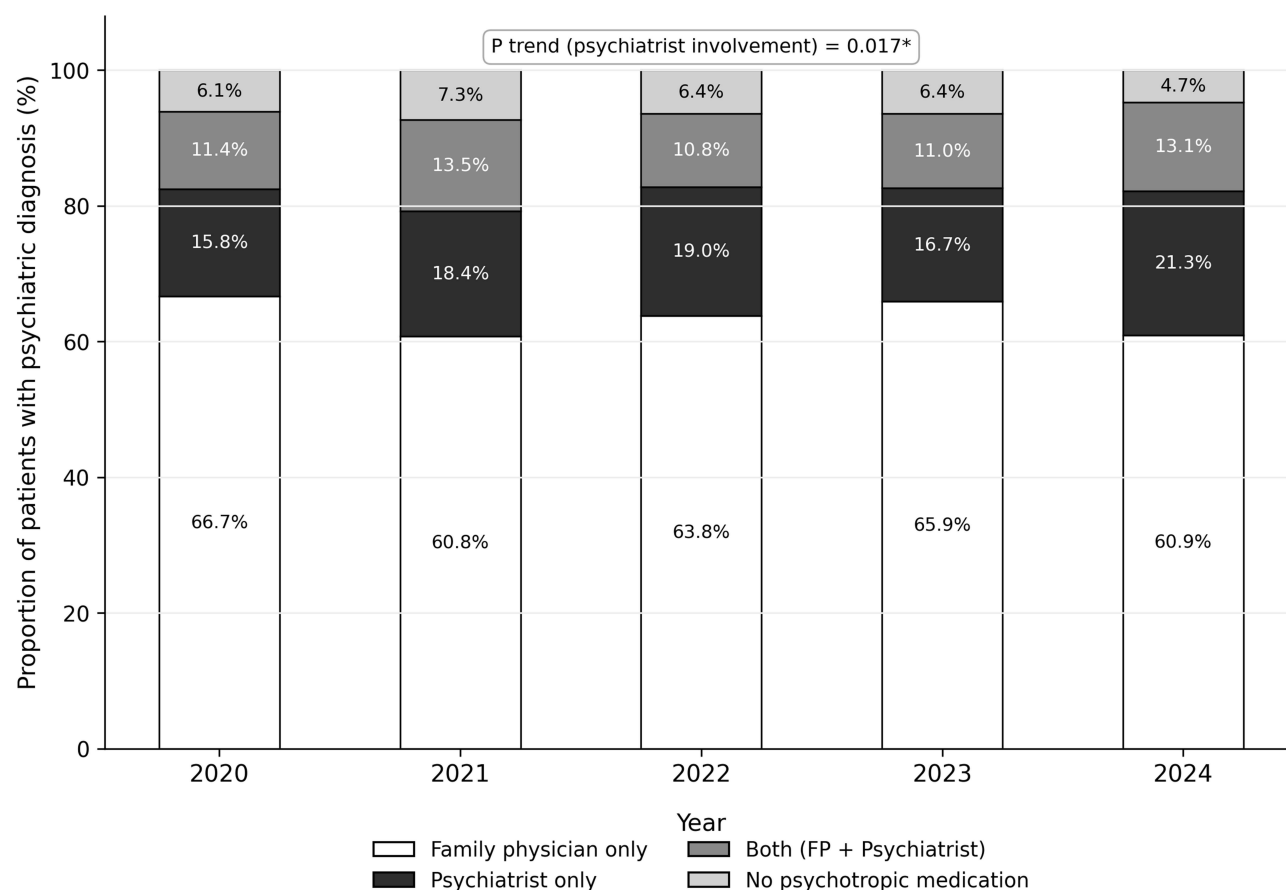


Figure 2 Psychotropic medication prescribing patterns by provider type among COPD patients with psychiatric diagnosis in Lithuania (2020–2024). Proportions expressed as a percentage of all patients with a psychiatric diagnosis. P for trend indicates the likelihood of psychiatrist involvement in prescribing over time (aOR = 1.04 per year, 95% CI: 1.01–1.08, $p = 0.017^*$). The symbol “*” indicates statistical significance at $p < 0.05$.

Abbreviation: FP, family physician.

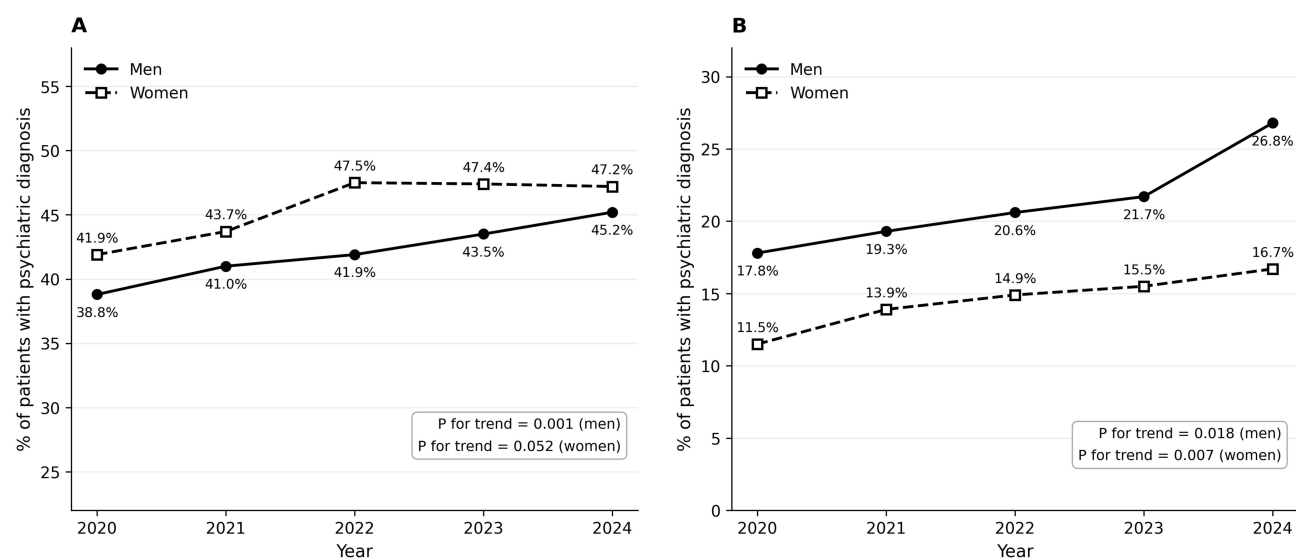


Figure 3 Annual trends in benzodiazepine (A) and antidepressant (B) prescribing by sex among COPD patients with psychiatric diagnosis in Lithuania (2020–2024). Proportions expressed as a percentage of patients receiving any psychotropic medication, stratified by sex. P for trend calculated using linear regression.

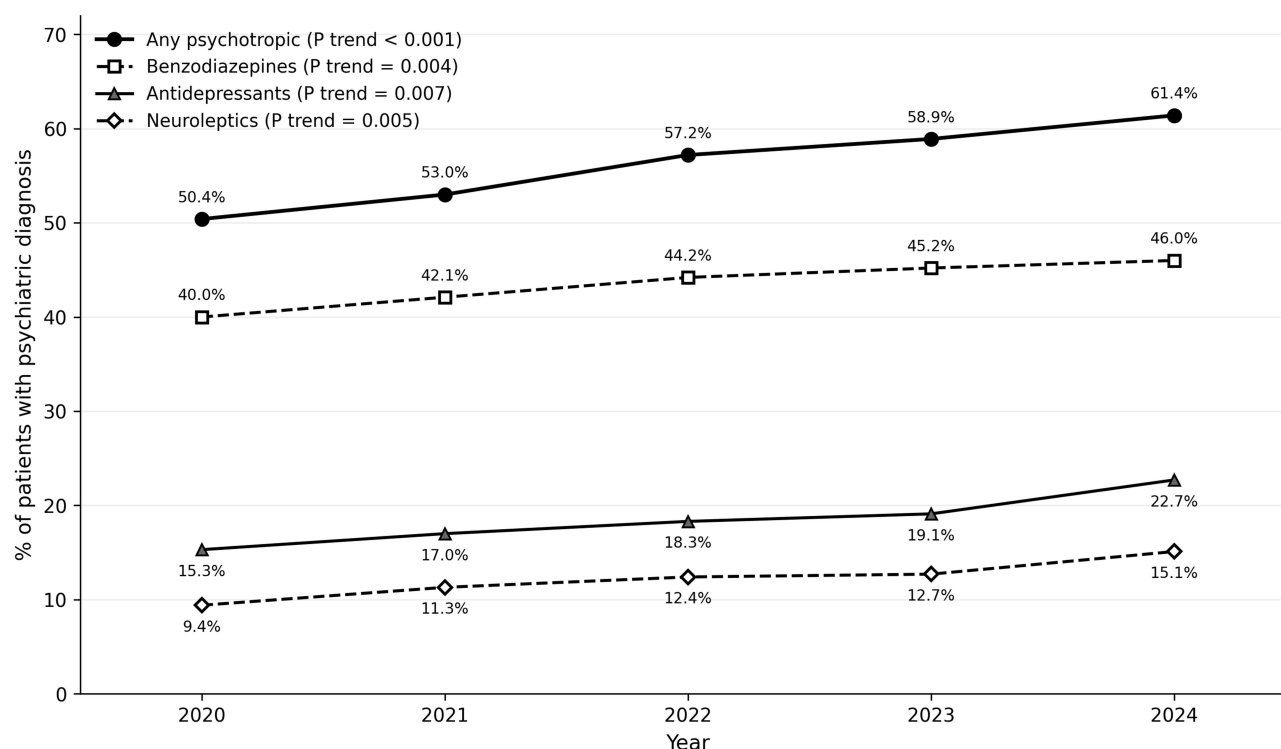


Figure 4 Annual trends in psychotropic medication prescribing rates among COPD patients with psychiatric diagnosis in Lithuania (2020–2024). Proportions expressed as percentage of all patients with a psychiatric diagnosis. P for trend calculated using linear regression.

Discussion

This nationwide study identified 64,246 unique COPD patients in Lithuania between 2020 and 2024, with case numbers steadily increasing over time. Similar global trends are linked to population aging, improved recognition of chronic respiratory conditions, and increased healthcare utilization. Compared with international data, Lithuania's COPD

Table 3 Multivariable Logistic Regression: Factors Associated with Psychotropic Medication Prescribing Among COPD Patients with Psychiatric Diagnosis in Lithuania (2020–2024)

Variable	Adjusted OR	95% CI	p-value
Outcome: Received any psychotropic medication (Yes vs No)			
Sex (Men vs Women)	0.687	0.644–0.732	<0.001
Calendar year (per 1-year increase)	1.070	1.046–1.095	<0.001
Outcome: Received benzodiazepines (among those with any psychotropic)			
Sex (Men vs Women)	1.371	1.246–1.508	<0.001
Calendar year	1.016	0.982–1.052	0.358
Outcome: Received antidepressants (among those with any psychotropic)			
Sex (Men vs Women)	2.168	1.979–2.374	<0.001
Calendar year	1.088	1.054–1.124	<0.001

(Continued)

Table 3 (Continued).

Outcome: Received neuroleptics (among those with any psychotropic)			
Sex (Men vs Women)	1.270	1.148–1.404	<0.001
Calendar year	1.095	1.055–1.135	<0.001
Outcome: Psychiatrist involvement in prescribing (vs family physician only)			
Calendar year (per 1-year increase)	1.040	1.007–1.075	0.017

Notes: Each section represents a separate logistic regression model. Men coded as reference category for sex comparisons.

Abbreviations: OR, odds ratio; CI, confidence interval.

prevalence and comorbidity rates appear to be moderate.^{15–17} During the study period, 18.1% of patients with COPD had a diagnosed psychiatric disorder, highlighting a substantial mental health concern. This rate exceeds the approximately 12.5% estimate for the general Lithuanian population,¹⁸ which may indicate a higher burden of psychiatric morbidity among patients with COPD. Anxiety disorders were the most common psychiatric conditions (15.0%), followed by depression (4.6%). This shift from earlier Lithuanian data (2012–2014), in which depression was more prevalent, may be related to changes in societal stress and healthcare access during the study period. Similar trends have been reported in studies from the UK and Sweden, which show moderate increases in anxiety and depression among patients with COPD,^{15,16} with comparable rates observed in Norway based on screening instruments.¹⁷ Higher prevalence rates in Spain, China, and the United States may reflect differences in healthcare systems, study populations, or inclusion of institutionalized patients.^{19–21} Gender differences were notable: after multivariable adjustment for age and calendar year, women showed significantly higher odds of psychiatric comorbidity (aOR = 2.40, 95% CI 2.32–2.48) and depressive disorders (aOR = 3.53, 95% CI 3.36–3.72), aligning with previous findings.²² These differences may be attributable to variations in symptom presentation, help-seeking behaviors, and diagnostic practices. Women are more likely to report affective symptoms and seek mental health care, whereas men's psychiatric problems may be underrecognized unless they present with somatic complaints.²³ Similar patterns have been observed across Europe.^{15–17,22} The period between 2020 and 2024 also coincided with major societal stressors, including the COVID-19 pandemic and regional geopolitical conflicts, which were associated in previous studies with increased rates of anxiety and depression.^{24,25} Lithuania has reported higher levels of anxiety and depression than the EU average, alongside low rates of help-seeking,²⁶ and WHO data indicate a global rise in these disorders during the first year of the pandemic.²⁷ These factors may have contributed to changes in mental health trends among patients with COPD, who are considered a vulnerable population due to chronic symptoms and functional impairments. Psychiatric diagnoses increased until 2022 and declined thereafter; however, the observational design of the study does not allow conclusions regarding the causes of these temporal trends. Among patients with psychiatric diagnoses, 61.9% received psychotropic medications. Most prescriptions originated from family physicians, predominantly anxiolytics and benzodiazepines, whereas psychiatrists more frequently prescribed antidepressants and neuroleptics. The frequent use of benzodiazepines may be clinically relevant due to their association with risks such as respiratory depression and increased mortality in patients with COPD.²⁸ Similar prescribing patterns have been reported internationally,²⁹ and benzodiazepine prescribing in COPD remains an important clinical consideration. Lithuanian regulations introduced in 2021, including mandatory electronic prescribing and restrictions on prescription duration,^{30,31} were intended to improve monitoring and reduce inappropriate use of psychotropic medications, particularly benzodiazepines. Changes in prescribing patterns observed after 2022 may have been influenced by multiple factors, including regulatory measures and changes in healthcare utilization; however, causal relationships cannot be established based on the present study design.

Limitations

Several limitations of this study should be acknowledged. First, psychiatric diagnoses were identified solely on the basis of ICD-10 codes recorded in outpatient administrative data, which may have led to an underestimation of the true

prevalence of anxiety and depressive disorders because of underdiagnosis or misclassification in routine clinical practice. Second, only outpatient records were included in the analysis; inpatient diagnoses and prescriptions were not captured, which may have lead to underestimation of psychiatric comorbidity and psychotropic medication use among patients with COPD who were more severely ill or frequently hospitalized. Third, psychotropic prescriptions were analyzed irrespective of their temporal relationship to the psychiatric diagnosis, as the dataset did not permit precise determination of the prescribing indication. Consequently, some prescriptions may have been issued for conditions other than anxiety or depression. Fourth, the analyses were adjusted for sex, age, and calendar year; however, several important potential confounders – including COPD severity, pulmonary function, exacerbation frequency, smoking status, oxygen therapy, and socioeconomic factors – were not available in the administrative dataset and therefore could not be accounted for. Finally, as the study was conducted in Lithuania, the findings may not be generalizable to healthcare systems with different clinical practices or prescribing patterns.

Conclusions

Anxiety and depression are common psychiatric comorbidities among patients with COPD in Lithuania and demonstrate notable gender-related differences. Psychotropic medications were predominantly prescribed in primary care settings, with benzodiazepines comprising the majority of anxiolytic treatments. These findings provide updated nationwide data on psychiatric comorbidity and psychotropic prescribing patterns among patients with COPD in Lithuania.

Artificial Intelligence Disclosure

The authors used Anthropic's Claude (Anthropic PBC, San Francisco, CA, USA) as an AI-assisted tool to support the graphical presentation of study results and table formatting. All statistical analyses, calculations, interpretation of results, and verification of accuracy were performed independently by the authors. No AI-generated conceptual illustrations, diagrams, or scientific images were used in this study. The authors take full responsibility for the accuracy and integrity of the reported results and conclusions.

Abbreviations

COPD, chronic obstructive pulmonary disease; EMR, electronic medical record; GDPR, General Data Protection Regulation; ICD-10, International Classification of Diseases, 10th Revision; OR, odds ratio; aOR, adjusted odds ratio; CI, confidence interval; FP, family physician; SDA, State Data Agency.

Data Sharing Statement

The data supporting the findings of this study were obtained from the Lithuanian State Data Agency. Restrictions apply to the availability of these data, which were used under license for the purposes of the current study and are therefore not publicly available.

Ethics Approval and Informed Consent

This study was based exclusively on anonymized administrative healthcare data obtained from the Lithuanian State Data Agency and did not involve direct participant contact, intervention, or identifiable personal information. According to the recommendations of the Lithuanian Bioethics Committee, “Ethical Principles for Non-Biomedical Health Research Related to Human Health” (Visuomenės sveikata, 2021;2(93)), studies using anonymized secondary administrative data fall outside the scope of the Lithuanian Biomedical Research Ethics Law and therefore do not require ethics committee approval or informed consent. All data were anonymized prior to access and analysis in accordance with national data protection legislation and the General Data Protection Regulation (GDPR).

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Disclosure

The authors declare no conflicts of interest related to this work.

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