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Chronic obstructive pulmonary disease and comorbidities:

a large cross-sectional study in primary care

Abstract

Background

Chronic obstructive pulmonary disease (COPD) is common, and a major cause of morbidity and mortality worldwide. Recent studies suggest that comorbidities of COPD increase the risk of hospitalisation, polypharmacy, and mortality, but their estimated prevalence varies widely in the literature.

Aim

To evaluate the prevalence of 38 physical and mental health comorbidities in people with COPD, and compare findings with those for people without COPD in a large nationally representative dataset.

Design and setting

A cross-sectional data analysis on 1 272 685 adults in Scotland from 314 primary care practices.

Method

Data on COPD, along with 31 physical and seven mental health comorbidities, were extracted. The prevalence of comorbidities was compared between people who did, and did not, have COPD, standardised by age, sex, and socioeconomic deprivation.

Results

From the total sample, 51 928 patients had COPD (4.1%). Of these, 86.0% had at least one comorbidity, compared with 48.9% of people without COPD. Of those with COPD, 22.3% had ≥ 5 comorbid conditions compared with 4.9% of those who did not have COPD (adjusted odds ratio 2.63, 95% confidence interval = 2.56 to 2.70). In total, 29 of the 31 physical conditions and six of the seven mental health conditions were statistically significantly more prevalent in people who had COPD than those who did not.

Conclusion

Patients with COPD have extensive associated comorbidities. There is a real need for guidelines and health care to reflect this complexity, including how to detect those common comorbidities that relate to both physical and mental health, and how best to manage them. Primary care, which is unique in terms of offering expert generalist care, is best placed to provide this integrated approach.

Keywords

comorbidity; COPD; general practice; multimorbidity; primary health care.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major global cause of morbidity and mortality, and is expected to become the third leading cause of death worldwide by 2020.¹ It has a significant impact on quality of life, even in its early — often undiagnosed — stages,² and is a leading cause of unscheduled hospital admission.³ Comorbid conditions are commonly associated with COPD and increase the risk of hospitalisation.^{4,5} Comorbidity in COPD has also been associated with higher levels of polypharmacy and higher mortality.^{6,7} Estimates of the prevalence of individual comorbidities associated with COPD vary substantially⁸ and studies investigating COPD and comorbidities often only consider a single or small number of conditions.^{9,10} Some studies have included a larger number of comorbidities but feature limitations, such as no control group.^{5,11}

A small number of cross-sectional studies have compared comorbidities in people who do and do not have COPD, with a variation in the number and type of comorbidities assessed. One Spanish study¹² analysed the prevalence of 25 chronic illnesses in 6357 individuals with COPD, but, rather than comparing data to people without COPD, they compared the observed prevalence of each comorbidity to a calculated expected prevalence. The most prevalent conditions in COPD were found to be hypertension, dyslipidaemia, and obesity. Another cross-

sectional study involving 15 018 individuals with COPD in a population of 341 329¹³ was the largest to date (at the time it was conducted), but the analysis was limited to determining and comparing the prevalence of 11 chronic conditions. The authors found an increased prevalence of ischaemic heart disease, heart failure, depression, diabetes mellitus, and lung cancer in people who had COPD compared with those who did not.

Mental health disorders are common in patients with COPD, although prevalence estimates vary substantially; as an example, rates range between 10% and 42% for depression.¹⁴ Hanania *et al* followed 2118 patients with COPD and compared them with 578 people without COPD in 12 countries; they found the prevalence of depression was 26% in people with COPD — two- to three-fold higher than in the non-COPD group.¹⁵ Comorbid depression or anxiety in people with COPD has been shown to increase utilisation of primary and secondary health care and reduce treatment adherence.¹⁴ The detection of these conditions is essential as they are frequently underdiagnosed in people with COPD.^{9,14}

The aim of this study was to determine the prevalence of physical and mental health comorbidities in people who had COPD, compared with those who did not, in a large nationally representative dataset in Scotland.

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How this fits in

Comorbidities of chronic obstructive pulmonary disease (COPD) have been associated with higher mortality, hospital admission, and polypharmacy, but the exact prevalence of individual comorbid conditions varies in the literature. This cross-sectional study looked at 38 comorbidities associated with COPD and their prevalence. Extensive comorbidities were found in people who had COPD compared with those who did not, resulting in a need to advocate for integrated primary and secondary care, and develop updated guidelines that take into account those complex comorbidities.

METHOD

Data were obtained from the Primary Care Clinical Informatics Unit at the University of Aberdeen for 1 272 685 patients aged ≥ 25 years who were alive and permanently registered with one of 314 Scottish general practices on 31 March 2007.¹⁶ Data on the presence of COPD, 31 chronic physical health conditions, and seven mental health conditions were extracted (Box 1). This study constituted a secondary data analysis using the original dataset from Barnett *et*

al's study,¹⁷ which featured comorbidities identified as important by NHS Scotland.¹⁶ The dataset was representative of the Scottish population in terms of age, sex, and level of socioeconomic deprivation; a more detailed explanation is available elsewhere.¹⁶

COPD was defined using a set of Read codes, based on definitions used by NHS Scotland's Information Services Division. There was no measure of severity of COPD or any other condition in the data analysis.

Controls were defined as all patients from the 1 272 685 group who did not have COPD. To control for differences between the two populations in age, sex, and level of deprivation, an approach was adopted that was similar to that undertaken in a previous study¹⁸ and standardised prevalence rates were generated by:

- age group (25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and ≥ 85 years);
- sex; and
- deprivation decile using the direct method.

These age–sex–deprivation standardised rates were then used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) for the prevalence of 31 physical conditions and seven mental health conditions in the adults who had COPD and those who did not. The overall number of physical and mental health conditions was documented.

Socioeconomic deprivation was measured using the Carstairs deprivation score, divided into deciles from the most affluent to the most deprived. The Carstairs score is based on each individual's residential postcode and is widely used in healthcare research as a measure of socioeconomic status.¹⁹ The authors used *t*-tests to analyse differences between groups and one-way analysis of variance for differences across age groups and deprivation deciles. For all statistical analyses, a *P*-value of < 0.05 was considered statistically significant. All analyses were performed using Stata (version 13).

RESULTS

There were 51 928 (4.1%) people with COPD from the total sample of 1 272 685 adults aged ≥ 25 years. Patient characteristics are outlined in Table 1. Compared with people without COPD, those with COPD were:

- slightly more likely to be females (46.4% of those with COPD were males, 49.0% of those without COPD were males);

Box 1. Potential comorbidities of COPD

Physical conditions

- Any new cancer in last 5 years
- Asthma
- Atrial fibrillation
- Bronchiectasis
- Chronic kidney disease
- Chronic sinusitis
- Cirrhosis/chronic liver disease/alcoholic liver disease
- Constipation
- Coronary heart disease
- Diabetes
- Diverticular disease
- Dyspepsia
- Epilepsy
- Glaucoma
- Hearing loss
- Heart failure
- Hypertension
- Inflammatory arthritis and related conditions, including gout
- Inflammatory bowel disease
- Irritable bowel syndrome
- Migraine
- Multiple sclerosis
- Painful condition
- Parkinson's disease and Parkinsonism
- Peripheral vascular disease
- Prostate disease
- Psoriasis or eczema
- Stroke or transient ischaemic attack
- Thyrotoxicosis/thyroid disorders, including hypothyroidism
- Viral hepatitis
- Visual impairment

COPD = chronic obstructive pulmonary disease.

Mental health conditions

- Alcohol misuse
- Anorexia or bulimia
- Anxiety and other neurotic, stress-related, and somatoform disorders
- Dementia
- Depression
- Learning disability
- Schizophrenia (and related non-organic psychosis) or bipolar disorder

- older (mean age 65.1 years versus 50.6 years, $P < 0.001$); and
- more likely to live in areas of high social deprivation (10.5% of people with COPD were from the most deprived decile compared with 8.0% of people without COPD).

Overall comorbidity

Table 2 shows that only 14.0% of people with COPD did not have any additional conditions compared with 48.9% of people without COPD (standardised OR 0.16, 95% CI = 0.15 to 0.17). After adjusting for age, sex, and deprivation standardisation, those who had COPD were significantly more likely to have ≥ 1 additional conditions than those who did not; differences increased with each additional condition. The largest difference was for ≥ 5 comorbidities, found in 22.3% of people with COPD compared with just 4.9% of those without COPD (standardised OR 2.63, 95% CI = 2.56 to 2.70).

People with COPD were significantly less likely to have no additional physical condition compared with those without COPD (17.5% versus 54.7%, standardised OR 0.42, 95% CI = 0.41 to 0.43). Conversely,

those with COPD were significantly more likely to have ≥ 1 additional condition than those without COPD. The largest difference was for ≥ 5 physical conditions (14.8% for those with COPD versus 2.9% for those without it; standardised OR 2.51, 95% CI = 2.42 to 2.59).

People who had COPD were:

- less likely to have no recorded mental health condition compared with those who did not have the disease (68.8% versus 84.3% respectively, standardised OR 0.50, 95% CI = 0.49 to 0.51);
- more likely to have one mental health condition (21.18% versus controls 11.9%; standardised OR 1.73, 95% CI = 1.69 to 1.77); and
- more than twice as likely to have ≥ 3 mental health conditions (1.5% versus 0.5%, OR 2.51, 95% CI = 2.32 to 2.76).

Comorbidity of individual conditions

Table 3 shows that 29 out of the 31 physical conditions were significantly more prevalent in people who had COPD compared with those who did not. The most prevalent conditions in people with COPD were:

- hypertension (35.3%);
- painful condition (24.5%);
- asthma (21.4%); and
- coronary heart disease (CHD, 20.8%).

The biggest differences between the COPD and non-COPD groups for individual conditions were for bronchiectasis (standardised OR 9.14, 95% CI = 8.38 to 9.47) and asthma (standardised OR 5.07, 95% CI = 4.96 to 5.18). Seven other physical conditions were more than twice as likely to be prevalent in those with COPD than those without it:

- heart failure (OR 2.35);
- viral hepatitis (OR 2.34);
- chronic sinusitis (OR 2.28);
- peripheral vascular disease (OR 2.23);
- chronic liver disease (OR 2.15);
- psoriasis/eczema (OR 2.03); and
- irritable bowel syndrome (OR 2.01).

Table 4 shows that six of the seven mental health conditions were significantly more prevalent in people who had COPD than those who did not — namely, alcohol misuse, anxiety, depression, schizophrenia, anorexia or bulimia, and dementia. After standardisation for age, sex, and deprivation score, the biggest differences were found for the prevalence of:

Table 1. Patient characteristics

Variable	COPD, n [%]	No COPD, n [%]
Patients	51 928	1 220 757
Mean age, years (SD)	65.1 (14.5)	50.6 (16.4)
Males	24 077 (46.4)	598 005 (49.0)
Age group, years		
25–34	1964 (3.8)	227 432 (18.6)
35–44	3388 (6.5)	275 605 (22.6)
45–54	5961 (11.5)	247 833 (20.3)
55–64	11 077 (21.3)	208 256 (17.1)
65–74	14 634 (28.2)	140 646 (11.5)
75–84	11 551 (22.2)	87 769 (7.2)
≥ 85	3353 (6.5)	33 216 (2.7)
Deprivation deciles		
1 Least deprived	2486 (4.8)	115 222 (9.4)
2	3364 (6.5)	123 286 (10.1)
3	3637 (7.0)	120 236 (9.8)
4	5659 (10.9)	146 235 (12.0)
5	6622 (12.8)	140 043 (11.5)
6	6637 (12.8)	136 648 (11.2)
7	6588 (12.7)	127 837 (10.5)
8	4487 (8.6)	102 982 (8.4)
9	6971 (13.4)	110 050 (9.0)
10 Most deprived	5477 (10.5)	98 218 (8.0)

COPD = chronic obstructive pulmonary disease. SD = standard deviation.

Table 2. Prevalence and odds ratio for number and type of comorbidity

	COPD, n(%)	No COPD, n(%)	Odds ratio (95% CI) ^a
Patients	51 928	1 220 757	
Total number of physical and mental health conditions			
0	7264 (14.0)	597 363 (48.9)	0.16 (0.15 to 0.17)
1	9305 (17.9)	271 751 (22.3)	0.81 (0.79 to 0.83)
2	9194 (17.7)	150 858 (12.4)	1.38 (1.35 to 1.42)
3	8139 (15.7)	88 888 (7.3)	1.66 (1.61 to 1.70)
4	6460 (12.4)	51 961 (4.3)	1.95 (1.89 to 2.01)
≥5	11 566 (22.3)	59 936 (4.9)	2.63 (2.56 to 2.70)
Total number of physical conditions			
0	9063 (17.5)	668 190 (54.7)	0.42 (0.41 to 0.43)
1	10 971 (21.1)	266 951 (21.9)	1.23 (1.21 to 1.25)
2	10 122 (19.5)	136 637 (11.2)	1.52 (1.48 to 1.56)
3	8253 (15.9)	73 986 (6.1)	1.78 (1.73 to 1.83)
4	5834 (11.2)	39 316 (3.2)	1.95 (1.88 to 2.03)
≥5	7685 (14.8)	35 677 (2.9)	2.51 (2.42 to 2.59)
Total number of mental health conditions			
0	35 729 (68.8)	1 029 339 (84.3)	0.50 (0.49 to 0.51)
1	11 324 (21.8)	145 819 (11.9)	1.73 (1.69 to 1.77)
2	4096 (7.9)	39 160 (3.2)	2.08 (2.00 to 2.15)
≥3	779 (1.5)	6439 (0.5)	2.51 (2.32 to 2.76)

^aStandardised by age, sex, and deprivation score. COPD = chronic obstructive pulmonary disease.

- alcohol misuse (7.6% of those with COPD versus 3.0% of those without; standardised OR 2.48, 95% CI = 2.40 to 2.57); and
- anxiety (11.2% of those who had COPD versus 4.0% of those who did not; standardised OR 2.14, 95% CI = 2.07 to 2.21).

The most prevalent mental health condition in people with COPD was depression (19.1% of those who had COPD versus 10.5% of those who did not, standardised OR 1.77, 95% CI = 1.71 to 1.82).

DISCUSSION

Summary

The prevalence of COPD was 4.1% in this Scottish study. Individuals who had COPD had more physical and mental health comorbidities compared with those who did not have COPD, even after controlling for age, sex, and level of deprivation. In total, 35 of the 38 conditions examined were more common in people with COPD. The study confirms that multiple comorbidity, which

is known to be associated with an increased risk of hospitalisation, polypharmacy, and mortality,^{8,20} is extremely prevalent in people with COPD.

Strengths and limitations

To the best of the authors' knowledge, this is the largest study to date that has evaluated the prevalence of 38 comorbidities of COPD in a nationally representative primary care sample; data on a third of the Scottish population were analysed. The data analysis was cross-sectional hence conclusions about causality cannot be made. Although this could be considered a potential limitation, this is inherent in any cross-sectional analysis and evaluation of cause was not this study's aim. Furthermore, the presence of a chronic illness may lead to increased diagnosis of other conditions due to closer monitoring.²¹

Certain comorbidities were not specifically included in the analysis, such as lung cancer or pulmonary hypertension, as this study involved a secondary data analysis and these conditions had been excluded from the primary data analysis. This could be considered a limitation because these conditions have previously been associated with COPD and evaluation of their prevalence may have been of interest.⁸

Moreover, the authors' acknowledge that certain conditions, such as viral hepatitis, were associated with smaller sample sizes (42 patients with COPD had viral hepatitis) compared with more common conditions such as diabetes (6315 patients with COPD had diabetes) and consequently the authors accept that they cannot be confident in the apparent strength of association between COPD and viral hepatitis with such a small sample.

Smoking data were not included in the data analysis, and so it was not possible to make comparisons on levels of smoking in people who did, and did not, have COPD.

Comparison with existing literature

This study's COPD prevalence of 4.1% was similar to the 3.4% found by a Canadian study²² but higher than 1.4% in a study from England.²³ Within the group of people with COPD, 86.0% had ≥1 comorbidities, slightly higher than the prevalence range of 76–82% found in three recent studies.^{5,22,24} The types of comorbidities included in different studies varied significantly, which is likely to account, at least in part, for these differences.

In the study presented here, the largest difference between the COPD group from

Table 3. Prevalence and odds ratios for individual physical conditions, by COPD status

	COPD, n(%)	No COPD, n(%)	Odds ratio (95% CI) ^a	P-value
Patients	51 928	1 220 757	–	
Bronchiectasis	988 (1.9)	1782 (0.1)	9.14 (8.38 to 9.47)	<0.001
Asthma	11 130 (21.4)	65 106 (5.3)	5.07 (4.96 to 5.18)	<0.001
Heart failure	3344 (6.4)	15 526 (1.3)	2.35 (2.23 to 2.47)	<0.001
Viral hepatitis	42 (0.1)	1096 (0.1)	2.34 (1.92 to 2.86)	<0.001
Chronic sinusitis	721 (1.4)	8217 (0.7)	2.28 (2.13 to 2.45)	<0.001
Peripheral vascular disease	3494 (6.7)	19 437 (1.6)	2.23 (2.13 to 2.34)	<0.001
Cirrhosis/chronic liver disease/alcoholic liver disease	307 (0.6)	2305 (0.2)	2.15 (1.87 to 2.48)	<0.001
Psoriasis or eczema	831 (1.6)	8836 (0.7)	2.03 (1.88 to 2.18)	<0.001
Irritable bowel syndrome	3316 (6.4)	47 141 (3.9)	2.01 (1.94 to 2.08)	<0.001
Painful condition	12 697 (24.5)	112 370 (9.2)	1.99 (1.94 to 2.04)	<0.001
Inflammatory arthritis and related conditions including gout	5821 (11.2)	51 461 (4.2)	1.86 (1.80 to 1.92)	<0.001
Coronary heart disease	10 811 (20.8)	70 645 (5.8)	1.78 (1.72 to 1.83)	<0.001
Dyspepsia	7112 (13.7)	71 481 (5.9)	1.78 (1.73 to 1.83)	<0.001
Constipation	4358 (8.4)	31 737 (2.6)	1.66 (1.59 to 1.73)	<0.001
Diverticular disease	4273 (8.2)	29 527 (2.4)	1.63 (1.56 to 1.71)	<0.001
Hearing loss	4868 (9.4)	47 104 (3.9)	1.61 (1.55 to 1.67)	<0.001
Migraine	499 (1.0)	8508 (0.7)	1.57 (1.44 to 1.71)	<0.001
Atrial fibrillation	3065 (5.9)	20 894 (1.7)	1.53 (1.45 to 1.62)	<0.001
Stroke or transient ischaemic attack	4307 (8.3)	32 167 (2.6)	1.50 (1.43 to 1.57)	<0.001
Epilepsy	663 (1.3)	10 886 (0.9)	1.48 (1.37 to 1.62)	<0.001
Visual impairment	884 (1.7)	7164 (0.6)	1.48 (1.34 to 1.62)	<0.001
Prostate disease	1736 (3.3)	13 484 (1.1)	1.45 (1.35 to 1.55)	<0.001
Diabetes	6315 (12.2)	67 410 (5.5)	1.41 (1.37 to 1.46)	<0.001
Thyrotoxicosis/thyroid disorders including hypothyroidism	5185 (10.0)	65 999 (5.4)	1.34 (1.30 to 1.39)	<0.001
Chronic kidney disease	3842 (7.4)	29 694 (2.4)	1.33 (1.27 to 1.40)	<0.001
Any new cancer in the last 5 years	3731 (7.2)	39 275 (3.2)	1.29 (1.23 to 1.35)	<0.001
Inflammatory bowel disease	596 (1.1)	8812 (0.7)	1.28 (1.17 to 1.40)	<0.001
Glaucoma	1498 (2.9)	14 387 (1.2)	1.20 (1.11 to 1.29)	<0.001
Hypertension	18 346 (35.3)	215 741 (17.7)	1.17 (1.14 to 1.20)	<0.001
Multiple sclerosis	120 (0.2)	3706 (0.3)	1.03 (0.88 to 1.21)	0.62
Parkinson's disease and Parkinsonism	232 (0.4)	2507 (0.2)	0.93 (0.77 to 1.13)	0.50

^aStandardised by age, sex, and deprivation score. All differences between the COPD and no-COPD groups are significant at $P<0.001$. COPD = chronic obstructive pulmonary disease.

those without was for bronchiectasis. Prevalence of bronchiectasis in people with COPD in this study was 1.9%. A recent meta-analysis²⁵ that included 14 observational studies found that comorbid bronchiectasis was associated with an increased risk of severe airway obstruction and mortality.

Asthma was commonly found in patients with COPD, which was expected for two reasons:

- some patients will have asthma-COPD overlap syndrome,²⁶ whereby there are chronic airway disease features that

Table 4. Prevalence and odds ratios for individual mental health conditions

	COPD, n(%)	No COPD, n(%)	Odds ratio (95% CI) ^a	P-value
Patients	51 928	1 220 757	–	–
Alcohol misuse	3952 (7.6)	36 616 (3.0)	2.48 (2.40 to 2.57)	P<0.001
Anxiety and other neurotic, stress-related, and somatoform disorders	5797 (11.2)	48 318 (4.0)	2.14 (2.07 to 2.21)	P<0.001
Anorexia or bulimia	272 (0.5)	4526 (0.4)	1.86 (1.67 to 2.08)	P<0.001
Depression	9941 (19.1)	128 200 (10.5)	1.77 (1.71 to 1.82)	P<0.001
Schizophrenia (and related non-organic psychosis) or bipolar disorder	752 (1.4)	11 391 (0.9)	1.66 (1.54 to 1.78)	P<0.001
Dementia	1078 (2.1)	10 602 (0.9)	1.09 (1.00 to 1.19)	0.04
Learning disability	125 (0.2)	4311 (0.4)	1.06 (0.92 to 1.22)	0.40

^aStandardised by age, sex, and deprivation score. All differences between the COPD and no-COPD groups are significant at P<0.001. COPD = chronic obstructive pulmonary disease.

overlap both conditions. Typically, there is variable airflow obstruction, which is not fully reversible.²⁶

- some people with COPD may be incorrectly coded as having asthma, which may overstate the prevalence of asthma as a comorbidity.

Chronic sinusitis was twice as common in the COPD group than the group without COPD. This association of sinusitis with COPD has previously been recognised, because it is thought that nasal inflammation can occur in addition to airway inflammation in COPD.²⁷

Previous studies have established that COPD is associated with hypertension and CHD,^{12,20} which this study confirmed. CHD is frequently underdiagnosed in people with COPD; this is important as the coexistence of CHD and COPD results in a worse prognosis than if a patient has one disease or the other.²⁸ This study demonstrated that individuals with COPD, compared with people without, were more likely to have heart failure, peripheral vascular disease, and cerebrovascular disease consistent with higher rates of hypertension and CHD, with smoking as a common risk factor.^{6,29,30} Research by Rutten *et al* identified a prevalence of 20.5% for heart failure in people with COPD — compared with 6.4% in this study — when screened for the condition using a number of diagnostic tests including an echocardiogram. It is therefore likely that the true prevalence of heart failure in COPD is higher than found in

this study, because patients with COPD are not routinely screened for heart failure.³¹

The prevalence of comorbid dyspepsia in patients with COPD presented here is in keeping with a longitudinal study by Benson *et al*,³² who noted a high prevalence of gastro-oesophageal reflux disease in patients with COPD, which was associated with an increased risk of exacerbation. The findings presented here of increased prevalence of diabetes mellitus in people who had COPD (12.2%) compared with those who did not was lower than the prevalence documented in two cross-sectional studies of 18.7%¹³ and 20%.¹²

The study presented here found higher levels of alcohol misuse in patients with COPD, compared with those without COPD, which may go some way to explaining the higher levels of chronic liver disease; however, there were also strong associations with viral hepatitis. One small Japanese study found that chronic hepatitis C virus infection was associated with an accelerated decline in lung function in patients with COPD;³³ hepatitis C was also found to be more prevalent in people with COPD than the general population in Brazil (7.5% versus 1.2–2.0%).³⁴ Notably, the code 'viral hepatitis' that was used in the study presented here did not differentiate between the hepatitis subtypes, so a direct comparison cannot be made on the prevalence of hepatitis C in Brazil. Further research is needed to evaluate whether there is a significant association between hepatitis C and COPD.

A previous meta-analysis identified a statistically significant association between psoriasis and COPD, with a higher risk of developing COPD with more severe psoriasis,³⁵ confirming this study's finding of increased risk of psoriasis in people who had COPD compared with those who did not.

This study found that, compared with people who did not have COPD, those with COPD were more likely to have one, and more than twice as likely to have two or more, mental health conditions. The biggest difference was for alcohol misuse, with the COPD group more than twice as likely to have been coded for this. There is a lack of studies investigating the prevalence of alcohol misuse in patients with COPD, but there is evidence of high rates of smoking in those who misuse alcohol.³⁶ The prevalence of anxiety and depression in those with COPD was 11.2% and 19.1% respectively, although both may be underdiagnosed.¹⁴ In the literature (which includes heterogeneous, often selected,

populations), the estimated prevalence of comorbid anxiety varies from 10–19%; for depression the figure is 10–42%.¹⁴

The exact mechanisms underpinning the diverse comorbidities associated with COPD are likely to be multifactorial and beyond the scope of this study. In short, some conditions may share common risk factors such as CHD and smoking.⁴ However, evidence suggests that COPD is associated with chronic systemic inflammation, independent of smoking, which, in turn, may lead to insulin resistance (contributing to metabolic syndrome and diabetes), cachexia, and a procoagulant state.^{29,37} COPD medication is also likely to exacerbate certain comorbidities: for example, prednisolone could contribute to diabetes, osteoporosis, and muscle dysfunction.³⁸ Further research is required to elucidate the exact mechanisms of the associated comorbidities.

Implications for research and practice

The findings from the current study found that there were 35 physical and mental health conditions which were more common in people who had COPD than people without. Various studies have outlined some of the implications of having conditions in addition to COPD. An Italian cohort study of 569 people with COPD found that 81.2% had additional comorbidity and acute exacerbations of COPD were more common in those with a higher number of comorbidities.⁵ Another study evaluating comorbid mental health conditions alongside COPD outlined significant implications such as poor compliance with treatment and increased frequency of hospital admissions, as well as prolonged inpatient stay.^{9,14}

This study demonstrates the high prevalence of COPD and that the presence of comorbidities is the rule, rather than the exception. The current healthcare model delivers fragmented care to patients with multiple comorbidities. The authors postulate that optimal management for these complex patients would involve integrating specialist and primary care services in order to provide comprehensive,

holistic health care. Primary care, which is unique in terms of offering expert generalist care, is best placed to provide this integrated approach.

The high level of COPD comorbidities is pertinent as, aside from issues regarding care quality, it also has an impact on healthcare costs. One recent Danish study³⁹ examining resource allocation in COPD care found that multimorbidity in COPD significantly increased the annual fee for service healthcare expenditure. Although it is unsurprising for comorbidities to increase healthcare costs, this highlights evidence for the added economic burden resulting from comorbidities.

Current guidelines for COPD management do not take into account comorbidities, even those that are common. The research behind the guidelines frequently excludes patients with multimorbidity, which influences the validity and generalisability of the treatments suggested for most people who have COPD. There is a real need for guidelines and health care to reflect the complexities associated with COPD, encompassing detection of the common physical and mental health comorbidities, as well as how best to manage them in combination. This study plays a vital part in determining the prevalence of comorbidities in COPD, which could contribute to the creation of these appropriate, comprehensive guidelines. If these were developed, it might be possible to reduce the number of admissions, and improve morbidity and mortality for patients with COPD, which, in turn, could have a significant economic and healthcare impact.

The study presented here has illustrated that the majority of patients with COPD have complex physical and mental health comorbidity. The authors propose that integrating primary and secondary care services would provide optimal holistic care for these patients. In addition, COPD guidelines should be based on valid, generalisable evidence and must reflect the associated comorbidities in order to provide clinicians with clear management strategies.

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Ethical approval

NHS Grampian Research Ethics Service approved the anonymous use of data for research purposes.

Provenance

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Competing interests

The authors have declared no competing interests.

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