

# COPD is Associated with Higher Prevalence of Back Pain: Results of a Population-Based Case–Control Study, 2017

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Marta Fuentes-Alonso<sup>1</sup>  
Ana López-de-Andrés<sup>2</sup>  
Domingo Palacios-Ceña<sup>3</sup>  
Rodrigo Jimenez-Garcia<sup>4</sup>  
Marta Lopez-Herranz<sup>5</sup>  
Valentin Hernandez-Barrera<sup>2</sup>  
Napoleon Perez-Farinos<sup>6</sup>  
Zichen Ji<sup>1</sup>  
Javier de-Miguel-Diez<sup>1</sup>

<sup>1</sup>Respiratory Department, Hospital General Universitario Gregorio Marañón, Facultad de Medicina, Universidad Complutense de Madrid, Instituto de Investigación Sanitaria Gregorio Marañón (IISGM), Madrid, Spain; <sup>2</sup>Department of Medical Specialties and Public Health, Universidad Rey Juan Carlos, Madrid, Spain; <sup>3</sup>Department of Physical Therapy, Occupational Therapy, Rehabilitation and Physical Medicine, Research Group of Humanities and Qualitative Research in Health Science of Universidad Rey Juan Carlos (Hum&QRinHS), Universidad Rey Juan Carlos, Madrid, Spain; <sup>4</sup>Department of Public Health & Maternal and Child Health, Faculty of Medicine, Universidad Complutense de Madrid, Madrid, Spain; <sup>5</sup>Faculty of Nursing, Physiotherapy and Podology, Universidad Complutense de Madrid, Madrid, Spain; <sup>6</sup>Department of Public Health and Psychiatry, Faculty of Medicine, Universidad de Málaga, Málaga, Spain

**Objective:** We aimed to assess whether patients suffering from COPD have a higher prevalence of chronic back pain (neck and low back pain) than age-, sex-, and residence-matched non-COPD controls. We also aimed to identify which variables are associated with chronic neck pain (CNP) and chronic low back pain (CLBP) among COPD patients.

**Methods:** We carried out a retrospective case–control study using data obtained from the Spanish National Health Survey conducted in 2017.

**Results:** We analyzed data from 1034 COPD and 1034 matched non-COPD controls. The prevalence of CNP and CLBP was 38.20% and 45.16%, respectively, among COPD patients and 22.82% and 28.34% for non-COPD controls, respectively ( $p < 0.001$  for both). Multivariable analysis showed that COPD patients had a 1.62-fold (95% CI 1.50–1.74) higher risk of CNP and a 1.83-fold (95% CI 1.73–1.91) higher risk of CLBP than non-COPD controls. Experiencing one type of pain greatly increased the risk of having the other. Factors associated with the presence of both types of pain among COPD patients included female sex, “fair/poor/very poor” self-rated health, migraine or frequent headache and use of pain medication. Being aged from 70 to 79 years was a risk factor for CLBP, and suffering from a mental disorder was a risk factor for CNP.

**Conclusion:** The prevalence of CNP and CLBP was significantly higher among COPD patients than among non-COPD controls after adjusting for age, sex and other relevant clinical variables. Our findings add new data to the knowledge of chronic pain in COPD patients.

**Keywords:** COPD, neck pain, low back pain, comorbidities, pain medication

## Introduction

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable condition that is characterized by persistent and often progressive airflow limitation, mainly associated with tobacco smoking. It is a leading cause of morbidity and mortality worldwide and induces a substantial economic and social burden. In addition, the prevalence and burden of COPD are projected to increase over the coming decades due to continued exposure to COPD risk factors and aging of the world population.<sup>1</sup>

Symptoms, including dyspnea, cough, and sputum production, are relatively common in COPD patients and constitute risk factors for poor health-related quality of life and a decrease in their physical activity.<sup>2</sup> Most recently, chronic pain has been reported as a frequent symptom in these patients, in addition to the previous

Correspondence: Ana López-de-Andrés  
Department of Medical Specialties and Public Health, Universidad Rey Juan Carlos, Av Atenas s/n, Alcorcón, Madrid 28922, Spain  
Email [ana.lopez@urjc.es](mailto:ana.lopez@urjc.es)

ones, and in turn, it can have a negative impact on the degree of dyspnea, physical activity, and quality of life of these patients.<sup>3</sup>

Pain in patients with COPD can have different causes. Low back pain is one of the most common localizations.<sup>4</sup> Other body localizations of pain in these patients are the neck, trunk, and limbs.<sup>5–7</sup> The potential mechanisms that can cause, contribute to, or maintain this symptom in individuals with COPD include the mechanical limitations of the movement of the chest wall as a result of hyperinflation, musculoskeletal disorders, postural deviations, osteoporosis, compression fractures, vertebral deformations, costovertebral arthropathy, side effects of prolonged use of steroids, the presence of comorbidities, and certain individual characteristics, such as gender and socioeconomic factors.<sup>8</sup>

The incidence, severity, and risk factors for pain in patients with COPD are rather heterogeneous.<sup>9</sup> The prevalence rates for pain range between 21% and 82% among COPD patients, depending on factors such as the clinical context of the study population, sampling source, measurement instrument and study period.<sup>8</sup> Regarding severity, it has been reported that the pain experienced by COPD patients is stronger than that perceived by those without a respiratory disease or by patients with other chronic diseases<sup>10</sup> and is comparable to the pain observed in oncologic patients at the terminal stage.<sup>4,11</sup> However, in the few studies that have been conducted so far, various methods have been used to assess pain in COPD patients, which could lead to misinterpretation of the phenotype of this symptom and justify the wide range in the estimated prevalence of pain that has been reported.<sup>12</sup> Regarding risk factors, a recent study has highlighted the influence of age, sex, blood pressure, and obesity in some types of pain suffered by these patients.<sup>13</sup> Nevertheless, the role of other comorbidities in the presence of pain in COPD remains controversial.<sup>14</sup>

These limitations highlight the need for additional research on the prevalence and characteristics associated with the occurrence of pain in COPD patients. Improving knowledge of these aspects is important and necessary to improve pain recognition and treatment in individuals with this disease.

Using the Spanish National Health Survey conducted in 2017 (SNHS2017), we aimed to assess whether patients suffering from COPD have a higher prevalence of chronic back pain (neck and low back pain) than age-, sex-, and residence-matched non-COPD controls. We also aimed to

identify which variables are associated with chronic neck pain (CNP) and chronic low back pain (CLBP) among COPD patients.

## Materials and Methods

### Study Design

We designed a case-control study. The data used were obtained from the SNHS2017 conducted in Spain from October 2016 to October 2017. Details in the methodology can be found elsewhere.<sup>15</sup> Briefly, the SNHS2017 includes a representative sample of the Spanish population aged 15 years or older residing in main family dwellings. The sampling method is a stratified three-stage sampling: first stage units are the census tracts; the second stage units are the main family dwellings; in the third stage, an adult (aged  $\geq 15$  years) was randomly selected (Kish method) from each household to fill in the questionnaire.<sup>15</sup>

The information collection method is computer-assisted personal interviews (CAPIs). For our investigation, we selected only persons aged 35 years or older. The reason for this cutoff point is the extremely low prevalence of COPD below this age.<sup>16</sup>

### Study Variables

In the SNHS2017, the self-reported presence of chronic conditions is collected using three consecutive questions: 1) Do you have or have you ever had any of the following diseases or health conditions? 2) Have you suffered this disease/health condition in the past 12 months? And 3) Was this disease/health condition been diagnosed by a doctor? A card with a list of 32 conditions is shown to the person interviewed after the first question, and for those conditions reported by the participant, the second and third questions are completed consecutively for each specific condition.

Participants were asked if they suffered COPD, and only persons who answered affirmatively to the three questions used to identify the presence of this disease were considered “COPD sufferers”. The same method was used to identify participants who suffered CNP and CLBP.

All participants were informed by the interviewer, prior to answering these questions, that a “chronic disease or health condition” is one that has lasted for at least 6 months.<sup>15</sup>

The independent variables analyzed and their categories are detailed in [Tables 1](#) and [2](#) and included age,

**Table I** Distribution According to Study Variable Among Patients with COPD and Age–Sex–Province of Residence-Matched Non-COPD Subjects

Variables	Categories	Non-COPD		COPD		P
		N	%	N	%	
Educational level	Secondary High education	127 162	12.28 15.67	135 135	13.06 13.06	0.230
Monthly income	800–1300€ >1300€	207 239	32.65 37.69	217 215	33.33 33.02	0.161
Living with a partner	Yes	578	55.89	563	54.45	0.473
Self-rated health	Very good/ good	546	52.83	251	24.27	<0.001
Asthma	Yes	42	4.06	285	27.57	<0.001
Heart disease <sup>a</sup>	Yes	122	11.80	220	21.28	<0.001
Diabetes	Yes	174	16.83	243	23.50	<0.001
High blood pressure	Yes	415	40.14	460	44.48	0.045
Cancer	Yes	38	3.68	65	6.29	0.109
Mental disorders <sup>b</sup>	Yes	139	13.44	272	26.31	<0.001
Migraine or frequent headache	Yes	75	7.26	154	14.85	<0.001
Body mass index <sup>c</sup>	25–29.9 kg/m <sup>2</sup> ≥30	437 197	42.27 19.05	384 296	37.14 28.63	<0.001
Physical exercise <sup>d</sup>	4–7 days	348	33.66	338	32.69	0.640
Tobacco use	Ex-smoker Current smoker	339 157	32.78 15.19	396 207	38.30 20.02	<0.001
Alcohol consumption <sup>e</sup>	Yes	378	36.57	390	37.72	0.585
Pain intensity <sup>f</sup>	Moderate Severe/ extreme	211 120	35.52 20.20	279 252	36.76 33.14	<0.001
Use of pain medication <sup>g</sup>	Yes	375	44.32	555	56.58	<0.001
Chronic neck pain	Yes	236	22.82	395	38.20	<0.001
Chronic low back pain	Yes	293	28.34	467	45.16	<0.001

**Notes:** P value obtained comparing COPD vs matched non-COPD controls;

<sup>a</sup>Heart disease included coronary disease, myocardial infarction and angina;

<sup>b</sup>Mental disorder included anxiety and/or depression; <sup>c</sup>Body mass index bases on self-reported height and weight; <sup>d</sup>Physical exercise. Days per week with walking for at least 10 minutes; <sup>e</sup>Alcohol consumption. If the subject has consumed alcohol two or more times a month over the last year; <sup>f</sup>Pain intensity in the last 4 weeks;

<sup>g</sup>Consumption of physician-prescribed pain medication in last 2 week.

sex, educational level, monthly income, living with a partner and self-rated health. The pain characteristics analyzed were pain intensity and the use of pain medication prescribed by a physician.

The same methods used to identify those with COPD, CNP and CLBP were used to determine the presence of self-reported asthma, heart disease, diabetes, high blood pressure, cancer, mental disorders (anxiety and/or depression) and migraine or frequent headache. Lifestyle variables included body mass index, physical exercise, tobacco use and alcohol consumption.

All the questions included in the SNHS2017 and explanations on how the questionnaires are conducted are described elsewhere.<sup>15,17</sup>

## Case–Control Design

The prevalence of COPD among those aged 35 years or over in the SNHS2017 was 5.99%, with a mean age of 68.29 years (SD 13.58, SEM 0.623, CR 0.189). The mean age for those without COPD was significantly lower ( $p<0.001$ ), 46.58 years (SD 18.58 SEM 0.399, CR 0.189). Given this large difference, it is necessary to match COPD patients with non-COPD subjects to obtain comparable populations. To do this, for every person with COPD (patient), we used the SNHS2017 database to identify a participant without COPD (control) with exactly the same age, sex and residence as the control. If more than one control was available for a patient, the selection was done randomly. We were able to find a matched control for each of the 1034 COPD participants identified in the SNHS2017.

## Statistical Analysis

All results are shown and compared according to the presence of COPD. We estimated the prevalence of CNP and CLBP according to the study variables. As descriptive statistics for quantitate variables, we used means, standard deviations, standard error of the mean (SEM) and coefficient of variation (CV) and for qualitative variable proportions. To compare proportions between matched patients and controls, we used the McNemar test. A paired Student's *t*-test was used to compare means. To assess the association between the study variables and the presence of CNP and CLBP within the two study populations (patients and controls), we used the Chi square test.

Multivariable conditional logistic regression models were constructed to estimate the risk of suffering CNP and CLBP among COPD patients versus non-COPD controls after adjusting for possible confounders.

Unconditional logistic regression models were used to identify which variables were independently associated with self-reported CNP and CLBP among COPD sufferers.

**Table 2** Prevalence of Chronic Neck Pain and Chronic Low Back Pain Among COPD Subjects and Non-COPD Controls According to Pain Characteristics, Health Status and Lifestyles Variables

		Chronic Neck Pain				Chronic Low Back Pain			
		Non-COPD		COPD		Non-COPD		COPD	
		N	%	N	%	N	%	N	%
Concomitant chronic neck pain <sup>c, d</sup>	No	NA	NA	NA	NA	91	31.06	141	30.16
	Yes	NA	NA	NA	NA	192	65.53	326	69.81
Concomitant chronic low back pain <sup>c, d</sup>	No	42	17.79	69	17.47	NA	NA	NA	NA
	Yes <sup>a</sup>	182	77.12	326	82.53	NA	NA	NA	NA
Pain intensity <sup>cd</sup>	Light <sup>a, b</sup>	52	19.77	61	26.64	68	25.86	84	36.68
	Moderate <sup>a, b</sup>	91	43.13	134	48.03	107	50.71	157	56.27
	Severe/extreme <sup>a, b</sup>	65	54.16	160	63.61	72	62.22	180	71.67
Use of pain medication <sup>c, d</sup>	No <sup>a, b</sup>	65	13.80	91	21.36	75	15.92	118	27.70
	Yes <sup>a, b</sup>	157	41.87	293	52.79	200	53.33	335	60.36
Migraine or frequent headache <sup>c, d</sup>	No <sup>a, b</sup>	198	83.89	218	72.66	239	84.98	338	72.38
	Yes <sup>a, b</sup>	38	16.11	108	27.34	44	15.02	129	27.62
Self-rated health <sup>cd</sup>	Fair/poor/very poor <sup>a, b</sup>	171	35.04	343	43.81	207	42.42	408	52.11
	Very good/good <sup>a, b</sup>	65	11.90	52	20.72	86	15.75	59	23.51
Asthma <sup>c, d</sup>	No <sup>a, b</sup>	224	22.58	264	35.25	282	28.43	314	41.92
	Yes <sup>a</sup>	12	28.57	131	45.96	11	26.19	153	53.68
Heart disease <sup>c, d</sup>	No <sup>a, b</sup>	202	22.15	282	34.64	249	27.30	351	43.12
	Yes <sup>a, b</sup>	34	27.87	113	51.36	44	36.07	116	52.73
Diabetes <sup>d</sup>	No <sup>a-c</sup>	195	22.67	299	37.80	246	28.60	342	43.24
	Yes	41	23.56	96	39.51	47	27.01	125	51.44
High blood pressure <sup>c, d</sup>	No <sup>a-c</sup>	129	20.84	202	35.19	160	25.85	236	41.11
	Yes <sup>a-c</sup>	107	25.78	193	41.96	133	32.05	231	50.22
Cancer <sup>c</sup>	No <sup>a-c</sup>	221	22.19	363	37.46	277	27.81	438	45.20
	Yes <sup>a, b</sup>	15	39.47	32	49.23	16	42.11	29	44.62
Mental disorders <sup>c, d</sup>	No <sup>a, b</sup>	176	19.66	243	31.89	225	25.14	300	39.37
	Yes <sup>a, b</sup>	60	43.17	152	55.88	68	48.92	167	61.40
Body mass index (kg/m <sup>2</sup> ) <sup>d</sup>	<25 <sup>a, b</sup>	68	22.15	115	40.21	70	22.80	125	43.71
	25–29.9 <sup>a-c</sup>	99	22.65	126	32.81	122	27.92	155	40.36
	≥30 <sup>a, b</sup>	48	24.37	123	41.55	73	37.06	150	50.68
Physical exercise <sup>d</sup>	0–3 days <sup>a, b</sup>	168	24.49	274	39.37	212	30.90	335	48.13
	4–7 days <sup>a, b</sup>	68	19.54	121	35.80	81	23.28	132	39.05
Tobacco use <sup>c, d</sup>	Never <sup>a, b</sup>	142	26.39	189	43.85	164	30.48	225	52.20
	Ex-smoker <sup>a, b</sup>	66	19.47	130	32.83	83	24.48	158	39.90
	Current smoker <sup>a, b</sup>	28	17.83	76	36.71	46	29.30	84	40.58
Alcohol consumption <sup>c, d</sup>	No <sup>a, b</sup>	167	25.46	282	43.79	210	32.01	335	52.02
	Yes <sup>a, b</sup>	69	18.25	113	28.97	83	21.96	132	33.85

**Notes:** <sup>a</sup>Significant difference ( $p < 0.05$ ) between COPD sufferers and non-COPD sufferers for chronic neck pain; <sup>b</sup>Significant differences ( $p < 0.05$ ) between COPD sufferers and non-COPD sufferers for chronic low back pain. Comparisons conducted using McNemar test; <sup>c</sup>Significant association ( $p < 0.05$ ) between the variable and chronic neck pain among COPD sufferers; <sup>d</sup>Significant association ( $p < 0.05$ ) between the variable and chronic low back pain among COPD sufferers. Comparisons conducted using Chi square test.

Variables included in multivariable models were those significant in the bivariate analysis and those previously reported as relevant by the scientific literature. These models were conducted following the recommendation of Hosmer et al.<sup>18</sup>

The adjusted odds ratio (OR) with 95% confidence intervals (95% CI) is the measure of association provided by the multivariable models.

STATA 14.0 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP, USA) was used for statistical analysis using the command “svy” for complex sample analyses. Significance was set at two-tailed  $\alpha < 0.05$ .

## Ethical Aspects

In accordance with the Spanish legislation, as we used a public access dataset with all data anonymous, it was not necessary to obtain the approval of an ethics committee. The database can be downloaded freely by anyone.<sup>19</sup>

## Results

We analyzed data from 1034 COPD- and 1034 matched non-COPD controls. The distribution of the study populations is shown in Table 1. No differences in the sociodemographic characteristics analyzed were found between patients and controls after matching. COPD patients reported worse self-rated health and a higher prevalence of asthma, heart disease, diabetes, high blood pressure, mental disorders and migraine or frequent headache than non-COPD controls. Obesity and current smoking were more frequent (28.63% vs 19.05% and 20.02% vs 15.19%, respectively) among COPD patients ( $p < 0.001$ ). Severe/extreme pain intensity and use of pain medication were also more prevalent in COPD subjects ( $p < 0.001$ ).

The prevalence of CNP and CLBP was 38.20% and 45.16% among COPD patients, respectively, and 22.82% and 28.34% among non-COPD controls, respectively ( $p < 0.001$  for both). After multivariable analysis, the ORs showed a significantly higher adjusted risk of self-reporting CNP (OR 1.62; 95% CI 1.50–1.74) and CLBP (OR 1.83, 95% CI 1.73–1.91) among COPD patients than non-COPD controls.

show the prevalence of CNP and CLBP among COPD subjects and non-COPD controls according to sociodemographic variables.

The prevalence of CNP and CLBP was significantly higher among COPD patients than among non-COPD

controls for all the categories of the sociodemographic variables included in Figures 1–3.

Among COPD patients, the prevalence of CNP increased with age, from 34.30% in the lower age group to 42.08% in the highest. Women had two times higher values than men (50.85% vs 24.85%;  $p < 0.001$ ).

For CLBP, the highest prevalence among COPD patients was found in the age group of 70–79 years (51.70%), and the lowest was found in the age group of 35–59 years (39.71%). A total of 55.56% of women with COPD reported CLBP compared with 34.19% of non-COPD women ( $p < 0.001$ ).

As seen in Table 2, regarding pain characteristics, COPD sufferers with CNP or CLBP showed higher pain intensity, more use of pain medication and higher prevalence of migraine or frequent headache than controls. Compared with the controls, subjects with COPD had a higher prevalence of both CNP and CLBP for all the health status and lifestyle variables analyzed.

Among COPD controls, the prevalence of CNP was higher for those with worse self-rated health and suffering any of the diseases analyzed than among those with better self-rated health and not suffering these conditions. The highest prevalence of CNP for COPD patients was found among those suffering mental disorders (55.88%) and heart disease (51.36%).

Regarding lifestyles, a BMI of 30 kg/m<sup>2</sup> or over and practicing less physical exercise were variables associated with a higher prevalence of CNP among COPD sufferers.

COPD patients experienced more severe CLBP if they had worse self-rated health or any of the clinical conditions analyzed than COPD patients with better self-rated health and not experiencing these conditions.

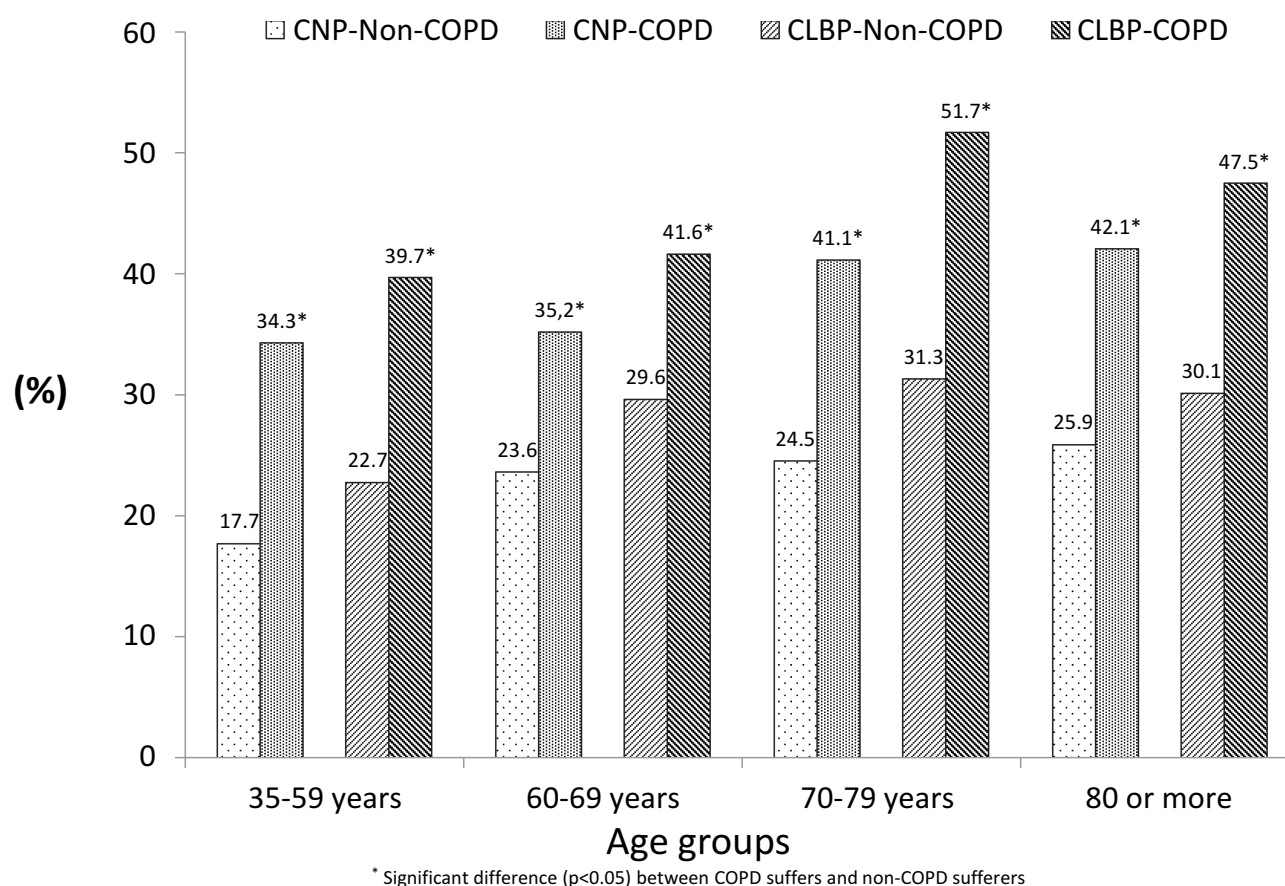
CLBP was reported by 61.40% of COPD patients with mental disease and over half of those with concomitant asthma (53.68%), heart disease (52.73%), high blood pressure (50.22%) or BMI  $\geq 30$  (50.68%).

The predictors for CNP and CLBP among COPD patients after multivariable adjustment are shown in Table 3. For CNP and CLBP, the probability of reporting these pains was significantly higher among women, those with “Fair/poor/very poor” self-rated health, pain medication users and those who reported migraine or frequent headache.

For CNP, the risk increased significantly among COPD patients with mental disorders and among those who reported suffering concomitant CLBP.

Among COPD subjects, those aged 70–79 years old had a 1.67 times higher risk of CLBP than those aged





**Figure 1** Prevalence of chronic neck pain (CNP) and chronic low back pain (CLBP) among COPD subjects and non-COPD controls according to age groups. \*Significant difference ( $p < 0.05$ ) between COPD sufferers and non-COPD sufferers.

35–59 years old. Finally, concomitant CNP was a risk factor for CLBP.

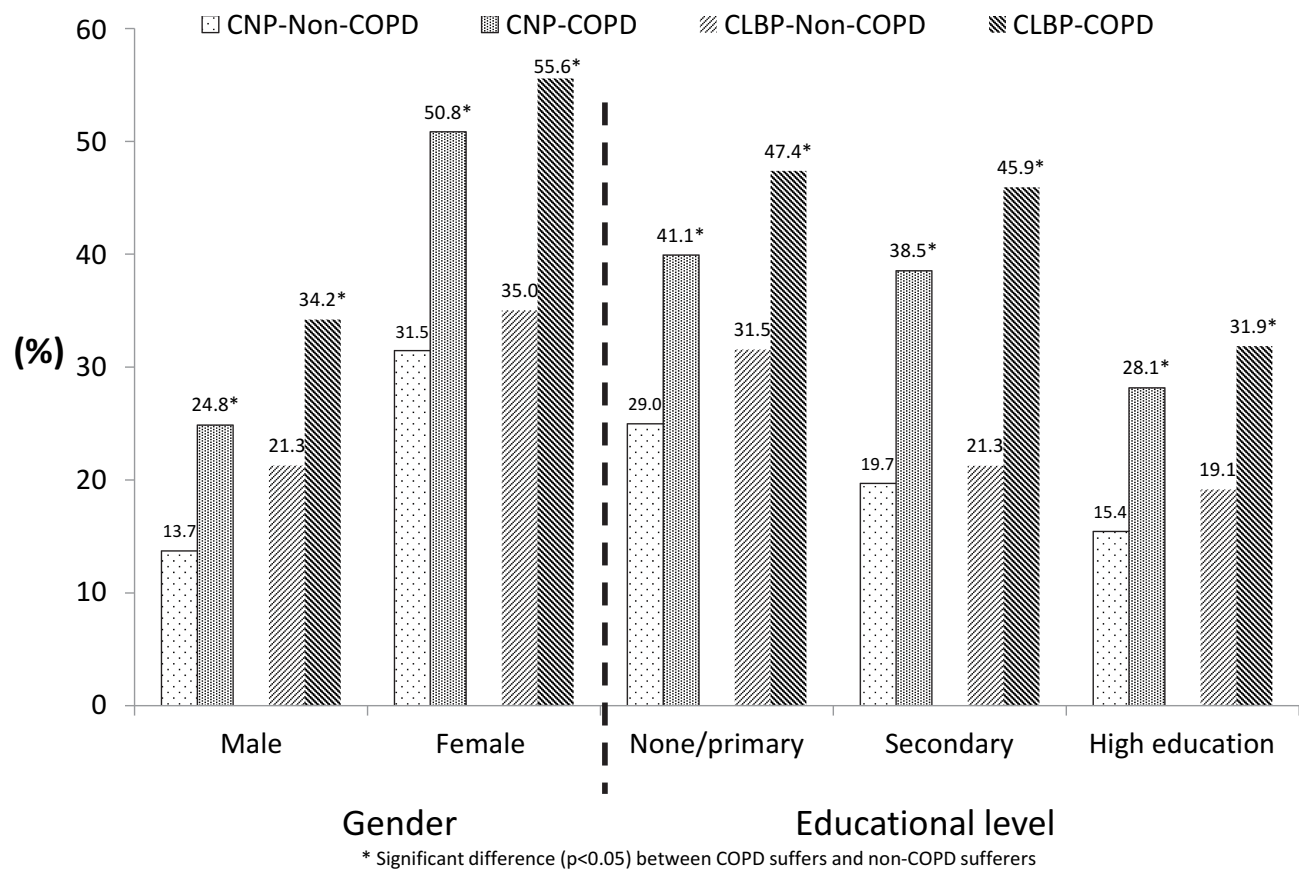
## Discussion

Our study demonstrated that COPD patients had a significantly higher risk of CNP and CLBP than non-COPD controls. In addition, we observed that experiencing one type of pain greatly increased the risk of having the other among individuals with COPD. Moreover, COPD patients with CNP and CLBP showed higher pain intensity, more use of pain medication and higher prevalence of migraine or frequent headache than controls without COPD.

The prevalence of CNP and CLBP in our study is consistent with previous studies.<sup>14,20</sup> Greater pain in the COPD population could be due to more prolonged induction of painful stimuli or possibly to lower thresholds for this symptom compared to non-COPD controls. Possible etiologies include systemic inflammation, central adaptations related to pain and dyspnea, and musculoskeletal conditions.<sup>6</sup>

Among COPD patients, being aged between 70 and 79 years was associated with a higher risk of CNP than being aged between 35 and 59 years old. Regarding gender, female sex was a risk factor for CNP and CLBP. This finding is consistent with other authors who have also reported a higher prevalence of pain in women than in men.<sup>21</sup> Christiansen et al<sup>11</sup> also reported a higher frequency of pain in women with COPD than in men with this disease. Possible explanations to justify the differences in pain between women and men include neuroimmunological, hormonal, genetic, and psychological factors.<sup>22</sup> Furthermore, questions have also been raised as to whether men and women construct different meanings around pain, which may influence the way they report their experience of this symptom.<sup>23</sup>

Previous studies have shown that mental disorders are positively associated with subsequent back/neck pain onset.<sup>24</sup> We found higher probabilities of CNP in COPD patients with mental disorders, but we did not detect an association between mental disorders and CLBP. The



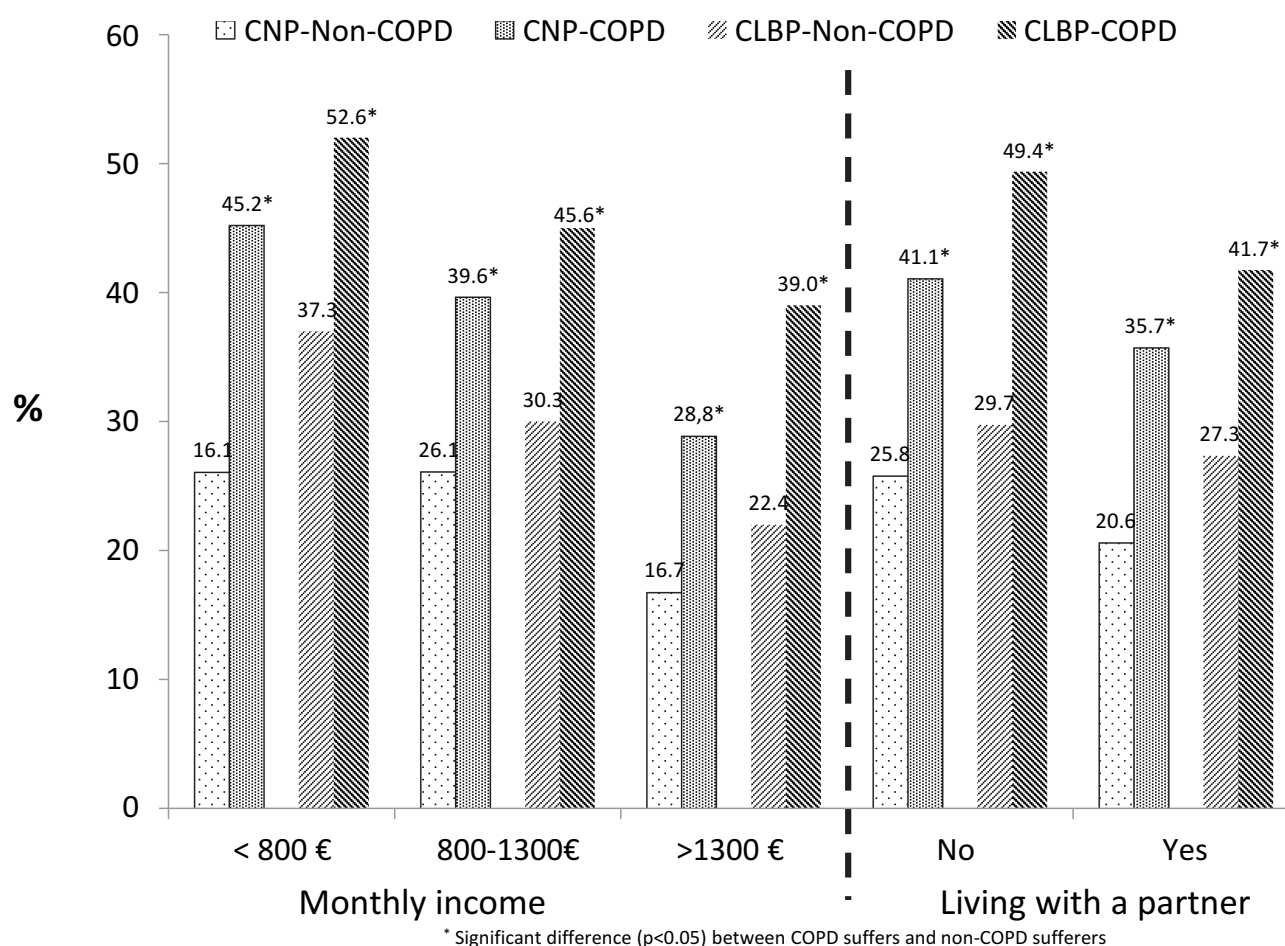
**Figure 2** Prevalence of chronic neck pain (CNP) and chronic low back pain (CLBP) among COPD subjects and non-COPD controls according to gender and educational level. \*Significant difference ( $p < 0.05$ ) between COPD sufferers and non-COPD sufferers.

relationship between chronic pain and mental disorders is complex and could be related to the neuroanatomical and functional overlap between pain and emotion/reward/motivation brain circuits.<sup>25</sup> Behavior-related mechanisms could also be relevant, since mental disorders are related to being sedentary and worse diets, leading to dyslipidemia and obesity, causing inflammation, which is in turn associated with both pain and psychiatric morbidity. Other lifestyle-related behaviors, such as occupational stress and tobacco smoking, may also contribute to psychoimmune dysfunctions and inflammation.<sup>24</sup>

Our results are in line with earlier studies reporting that pain is negatively associated with health-related quality of life and health status in patients with stable COPD.<sup>6,7,9,26,27</sup> Thus, COPD patients with poorer self-rated health had a significantly higher risk of CNP and CLBP than those with a better perception of their health. Van Dam van Issel et al<sup>28</sup> also showed that COPD patients with pain had a significantly and clinically relevant worse health status, attributed to the functional domain.

A relationship between migraine or severe headache and chronic health conditions, including COPD, has been reported in previous studies.<sup>29</sup> Our study further confirms that suffering from migraine or frequent headache is a risk factor for CNP and CLBP among COPD patients. These results corroborate previous reports indicating that headache or migraine is often associated with other musculoskeletal pains, including neck and back pains.<sup>30,31</sup> Furthermore, an increased number of comorbid pains has been significantly associated with a lower level of perceived general health.<sup>29</sup>

The probability of reporting CNP and CLBP in COPD patients in our study was significantly higher among pain medication users. Roberts et al<sup>32</sup> reported that COPD patients have substantially more utilization of pain medications than those with most other chronic diseases. In addition, they found that compared with patients with chronic disease other than COPD, individuals with COPD had a 47% higher prevalence of chronic use of pain or pain-related outpatient prescription medications and a 27% higher prevalence of chronic use of short-acting or long-acting opioid medications.<sup>33</sup>



**Figure 3** Prevalence of chronic neck pain (CNP) and chronic low back pain (CLBP) among COPD subjects and non-COPD controls according monthly income and living with a partner. \*Significant difference ( $p < 0.05$ ) between COPD sufferers and non-COPD sufferers.

We did not find a relationship between obesity and physical activity with the appearance of CNP and CLBP in patients with COPD in our study. In contrast, HajGhanbart et al<sup>6</sup> demonstrated that pain in the COPD population is associated with decreased physical activity and higher BMI. Pain-inducing activity limiting factors in these patients include comorbidities (ie, osteoporosis and osteoarthritis), specific medications (such as beta-2 agonists that can cause cramps in the calf muscles) and symptoms of deconditioning.<sup>34–36</sup> However, we did not collect information on musculoskeletal comorbidities, medication for COPD or symptoms of deconditioning, so we cannot assess this relationship. On the other hand, it has been suggested that obesity increases the prevalence of pain by increasing pro-inflammatory cytokines and increasing the risk of osteoarthritis.<sup>37</sup> In a vicious cycle, this symptom may also increase the risk of obesity by causing reductions in physical activity or hormonal changes.<sup>6</sup>

The strengths of this population-based study include a matched case–control design, the use of standardized surveys, and training of the data collectors. A matched case–control design is effective to avoid the confounding effect of age, sex and province of residence. Furthermore, the novelty of our work is that we analyzed sociodemographic variables that are not collected in clinical records and self-reported lifestyles and pain characteristics, variables that are not usually collected with standardized methods in the clinical settings. Furthermore, we used a large (over 1000 subjects) representative sample of the entire Spanish population suffering from COPD rather than a selected sample from one or several hospitals or primary care centers; in our opinion, this provides great external validity to our results.

While the analysis was rigorous, our findings have several limitations. First, comorbid COPD and CLBP/CNP may have various causal links (ie, depression, discopathy, inflammation, overweight/obesity) and consequences (ie,



**Table 3** Factors Associated with Suffering Chronic Neck Pain and Chronic Low Back Pain Among COPD Sufferers

		Chronic Neck Pain			Chronic Low Back Pain		
		OR	95% CI		OR	95% CI	
Age groups	35–59 years	NS	–	–	I		
	60–69 years	NS	–	–	1.20	0.76	1.88
	70–79 years	NS	–	–	1.67	1.08	2.59
	80 or more	NS	–	–	1.12	0.72	1.74
Sex	Man	I			I		
	Women	2.17	1.57	2.99	1.41	1.03	1.94
Self-rated health	Very good/good	I			I		
	Fair/poor/very poor	1.87	1.28	2.73	1.84	1.31	2.47
Mental disorder	No	I			NS	-	-
	Yes	1.43	1.00	2.05	NS	-	-
Use of pain medication	No	I			I		
	Yes	2.12	1.51	2.97	2.05	1.48	2.84
Migraine or frequent headache	No	I			I		
	Yes	1.56	1.01	2.41	1.83	1.16	2.89
Concomitant chronic neck pain	No	NIM	-	-	I		
	Yes	NIM	-	-	8.44	6.09	11.71
Concomitant chronic low back pain	No	I			NIM	-	-
	Yes	8.76	6.33	12.13	NIM	-	-

**Abbreviations:** NS, not significant; NIFM, not included in the final model; OR, odds ratios estimated using multivariable unconditional logistic regression; CI, confidence interval.

reduction in physical activity, therapy compliance, quality of life), which could not be fully investigated given the limited information collected by the SNHS2017. Furthermore, cross-sectional designs suffer from the possibility of reverse causality bias; therefore, we can identify significant associations but not establish risk factors or causality. Further prospective studies with more clinical variables are needed to confirm our results. Second, the only source to assess information on the types of pain analyzed is self-reporting; therefore, under- or overreporting may appear because of recall, information or social desirability biases. Third, we were able to adjust for a large number of potential confounding factors in the multivariate analyses, but the possibility of residual confounding by unrecognized factors cannot be definitively ruled out. Fourth, the specific characteristics of COPD are not collected in the SNHS2017, including severity of airway obstruction, disease duration or treatments. However, none of the included studies on pain or symptom burden in a recent meta-analysis reported a significant relationship between lung function and pain prevalence or severity.<sup>14</sup> Fifth, the validity of the self-reported conditions included in

the SNHS2017 has not been evaluated, which could have resulted in misclassification of patients in the analysis.

## Conclusions

In conclusion, the prevalence of CNP and CLBP was significantly higher among COPD patients than among non-COPD controls. In addition, suffering one of the pains greatly increased the risk of having the other and vice versa. Associated factors with suffering these types of pain among COPD subjects included age 70 to 79 years (only for CLBP), being female, having mental disorder (only for CNP), having worse self-rated health, suffering migraine or frequent headache, and using pain medication. Our findings add new data to the knowledge of chronic pain in COPD patients and justify its inclusion in clinical practice guidelines for this disease.

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## Disclosure

The authors declare no conflicts of interest.

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