Prevalence of COPD in Spain: impact of undiagnosed COPD on quality of life and daily life activities

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ABSTRACT

Aims: This study aimed to determine the prevalence of chronic obstructive pulmonary disease (COPD) in Spain and identify the level of undiagnosed disease and its impact on health-related quality of life (HRQL) and activities of daily living (ADL).

Methods: A population-based sample of 4274 adults aged 40–80 years was surveyed. They were invited to answer a questionnaire and undergo prebrochodilator and postbronchodilator spirometry. COPD was defined as a postbronchodilator FEV_1/FVC (forced expiratory volume in 1 s/forced vital capacity) ratio of <0.70.

Results: For 3802 participants with good-quality post-bronchodilator spirometry, the overall prevalence of COPD was 10.2% (95% CI 9.2% to 11.1%) and was higher in men (15.1%) than in women (5.6%). The prevalence of COPD stage II or higher was 4.4% (95%CI; 3.8%–5.1%). The prevalence of COPD increased with age and with cigarette smoking and was higher in those with a low educational level. A previous diagnosis of COPD was reported by only 27% of those with COPD. Diagnosed patients had more severe disease, higher cumulative tobacco consumption and more severely impaired HRQL compared with undiagnosed subjects. However, even patients with undiagnosed COPD stage I+ already showed impairment in HRQL and in some aspects of ADL compared with participants without COPD.

Conclusions: The prevalence of COPD in individuals between 40 and 80 years of age in Spain is 10.2% and increases with age, tobacco consumption and lower educational levels. The rate of diagnosised COPD is very high and undiagnosed individuals with COPD already have a significant impairment in HRQL and ADL.

The prevalence of chronic obstructive pulmonary disease (COPD) varies from country to country, mainly due to the effects of cumulative exposure to smoking and the increased life span of the population. There are increasingly more data on the prevalence and distribution of COPD from around the world, but until very recently most have been derived from expert opinion and not from well-conducted epidemiological studies using postbronchodilator spirometry[1]; moreover, studies differed in terms of age bands as well as in the use of different criteria of COPD.[2 3] Therefore, direct comparisons between prevalences obtained in different countries are not always possible. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) has resulted in an agreement on spirometric thresholds for diagnosis and severity and has become the gold standard, at least for epidemiological purposes.[2]

An epidemiological survey conducted from 1997 to 1998 in adults between 40 and 70 years of age in Spain reported a prevalence of COPD of 9.1%[3] according to the old European Respiratory Society (ERS) criteria for COPD.[4] Interestingly, only 22% had a previous diagnosis of the disease.[5] Early diagnosis is important to encourage smoking cessation, appropriate pharmacological treatment and physical exercise. The demonstration of impairment in activities of daily living (ADL) and health-related quality of life (HRQL), even in early undiagnosed disease, should alert clinicians of the importance of case detection in subjects at risk.

The main aim of the present study was to determine the GOLD-defined prevalence of COPD in Spain. Additionally, we aimed to identify the burden of undiagnosed COPD in the general population in terms of impairment in HRQL and ADL.

METHOD

Design of the study

The protocol of the EPI-SCAN study has been published elsewhere.[6] Briefly, it was a multicentre, cross-sectional, population-based, observational study conducted in 11 sites in 10 cities in Spain (Barcelona, Burgos, Córdoba, Huesca, Madrid (two areas), Requena, Sevilla, Oviedo, Vic and Vigo) representing different geographic, climatic and socio-economic regions. A priori sample size calculation estimated that assuming an expected prevalence of 12% derived from a previous study, and considering the different COPD criteria used in both surveys,[4] with a precision of ± 1 and with 20% of losses, a total sample of 5071 individuals would be required to fulfil the primary study goal, assuming a 5% alpha error and with 80% power. The participating sites agreed to recruit a population sample of at least 369 adults aged 40–80 years who were not institutionalised, and who were living in a well-defined administrative area covered by a reference hospital.

The study was approved by the Ethics Committee of the Hospital Clinic de Barcelona, as a reference IRB and consequently by the local Ethics Committees of the participating centers. All subjects provided written informed consent to participate in the study.

Study population

Participants were selected using a commercially available database that contained information on the telephone numbers of 3 728 305 residents in the areas selected, which represents >90% of the

households in those areas. Using random-digit telephone dialling, adults aged 40–80 years were identified, and those who agreed to join the study were contacted by phone by the local investigator to schedule a clinical visit. The subjects who could not be contacted after at least three attempts or those with mental disabilities were randomly replaced with new contacts. Responses to a minimal data questionnaire were obtained from all the subjects contacted.

COPD definitions

We used the definition of COPD proposed by GOLD: a postbronchodilator FEV_1/FVC (forced expiratory volume in 1 s/forced vital capacity) ratio below 0.70. The severity of COPD was also determined by the GOLD criteria.[2] The definition of GOLD stage 0 was according to that prevailing at the time that the study was designed: presence of chronic cough and sputum production with normal spirometry. Previous diagnosis of COPD was considered when the interviewee gave a positive answer to a previous diagnosis of COPD, emphysema or chronic bronchitis.

Measurements and instruments

Each subject answered a detailed written questionnaire compiled from a series of validated questionnaires. Data obtained included: demographic information; educational level; respiratory history and symptoms; smoking and family history; occupation; medication; and use of health services. Additionally, they completed the modified Medical Research Council (mMRC) questionnaire for dyspnoea[7] and the Spanish version of the European Commission for Steel and Coal (ECSC) questionnaire of respiratory symptoms.[8]

Lung function data were obtained at each site using the same equipment, Master Scope CT version 5.2 (VIASYS Healthcare, Hoechberg, Germany). Lung function was measured before and 15–30 min after inhalation of 200 mg of salbutamol according to American Thoracic Society (ATS) recommendations.[9] Calibration was checked daily with a 3 litre syringe. Participants performed up to eight forced expiratory manoeuvres to obtain three acceptable manoeuvres (FEV_1 and FVC variation $\leqslant$200 ml). According to the results of spirometry and the ECSC questionnaire, patients were classified into three different study groups: COPD (stages I–IV), GOLD stage 0 and control subjects. All subjects with COPD, as well as an equal number of GOLD stage 0 and control subjects recruited consecutively were invited to fill out a series of standardised questionnaires.

The London Chest Activity of Daily Living (LCADL) scale[10] translated into Spanish and validated,[11] is a specific questionnaire that consists of 15 items and four activity groups: self-care (4 items), domestic (6 items), physical (2 items) and leisure time (3 items). A global score as well as a score for each group of activities is obtained. The EQ-5D questionnaire, translated into Spanish and validated,[12] is a generic HRQL questionnaire that contains a descriptive system with five dimensions (mobility, self-care, daily activities, pain and anxiety or depression), and a visual analogue scale (VAS) that has a thermometer the ends of which are labelled with "the worst health state" and "the best health state", with scores from 0 to 100, respectively. The St George's Respiratory Questionnaire (SGRQ) is a specific HRQL questionnaire, translated into Spanish and validated,[13] that contains 50 items distributed in three dimensions: symptoms, activities and impact. The scores range from 0 to 100, with the lowest scores indicating a better HRQL.

Field work and quality control

The field work was done from May 2006 to July 2007 by one fully certified staff chest physician and one research nurse at each site. The results of the first 1745 spirometries representing all sites were centrally reviewed for quality. We verified that 89.1% of manoeuvres had an adequate initiation; 85.6% had a duration of at least 6 s and 90.6% reached a satisfactory tele-expiratory plateau. Considered globally, 80.3% of spirometric tracings fulfilled all acceptability criteria and 95.3% and 96.4% fulfilled the reproducibility criteria for FEV_1 and FVC, respectively, according to the ATS 2004 consensus.[9]

Statistical analysis

We estimated the overall COPD prevalence, the prevalence by age, gender, smoking status and severity of COPD, and the prevalence of risk factors and their association with other variables such as ADL and HRQL. The significance of comparisons was evaluated using the χ^2 test or Fischer exact test for categorical variables, and the Student t test or the Mann–Whitney parametric test for continuous variables. Following univariate analysis, two logistic regression models were constructed as an exploratory analysis to identify independent risk factors for COPD and factors significantly associated with the previous diagnosis of COPD compared with patients with undiagnosed COPD. The variables included in the first model were: age, gender, pack-years of smoking, educational level and centre. Variables included in the second model were the same plus severity of COPD by GOLD stages and SGRQ total score. Bilateral two-tailed hypotheses were formulated and 95% CIs were calculated, and a p value <0.05 was considered as statistically significant. The Bonferroni correction for multiple comparisons at an alpha level of 0.01 was applied. Statistical software (SPSS version 15.0 for Windows; SPSS, Chicaggo, Illinois, USA) was used.

RESULTS

Of a total of 4274 subjects randomly contacted by telephone at the 11 sites, 3885 agreed to participate in the study and a final group of 3802 (88.9%) were available for analysis (complete minimum data set on gender, age and lung function). The 389 (9.1%) who refused to take part in the survey were slightly older and there were more women and never and former smokers (see Supplementary material).

Table 1 shows the demographic and lung function characteristics of the study population.

COPD prevalence

Table 1 and fig 1 show the overall prevalence according to gender and age group. The overall COPD prevalence defined by the GOLD criteria was 10.2% (95% CI 9.2% to 11.1%), higher in men (15.1%) than in women (5.6%), and was significantly higher in subjects aged $\geqslant$70 years (22.9%) (table 2). The sample analysed allowed a precision of 96% for an estimate of 10.2% prevalence. COPD prevalence by the GOLD classification of severity was distributed as follows: mild, 56.4%; moderate, 38.3%; severe, 4.6%; very severe, 0.5%. The prevalence of GOLD stage II or higher was 4.4% (95% CI 3.8% to 5.1%), being 7.1% in men and 2.0% in women. The prevalence of GOLD stage 0 was 6.7% (95% CI 5.9% to 7.5%), 8.1% in men and 5.5% in women. A total of 408 (10.7%) individuals presented a restrictive spirometry pattern (FVC $<$80% and FEV_1/FVC $>$0.7), and they had a higher body mass index (BMI) and lower

Table 1 Demographic characteristics, smoking and lung function

Variable	Total (n = 3802)
Gender, men, n (%)	1797 (47.3)
Age, mean (SD)	56.6 (10.7)
BMI, mean (SD)	27.4 (4.5)
Smoking history, n (%)	
Smoker	989 (26.0)
Ex-smoker	174 (30.9)
Never smoker	1635 (43.1)
Pack-years (smokers and ex-smokers)	26.0 (21.5)
Education, n (%)	
Less than primary school	358 (9.4)
Primary school	1393 (36.7)
Secondary school	1105 (29.1)
University degree	912 (24.0)
Missing	30 (0.8)
Spirometry (postbronchodilator)	
FVC (litres)	3.74 (1.0)
FVC (% predicted)	96.8 (16.3)
FEV_1 (litres)	2.94 (0.9)
FEV_1 (% predicted)	102.1 (19.4)
FEV_1/FVC	0.79 (0.08)
Previous diagnosis of COPD, chronic bronchitis or emphysema, n (%)	203 (5.3)
Previous diagnosis of asthma, n (%)	261 (6.9)
City size:	
Small (<100 000 inhabitants)	1078 (28.3%)
Medium (100 000–500 000)	1268 (33.3%)
Large (>500 000)	1456 (38.3%)

BMI, body mass index; COPD, chronic obstructive pulmonary disease. FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity.

educational level compared with the subjects with normal spirometry (see Supplementary material)

Prevalence of risk factors

The overall prevalence of smoking was 26%, and 30.9% of subjects were ex-smokers. A total of 57% of women were never smokers compared with only 27.2% of men ($p<0.05$). The prevalence of COPD was significantly higher in heavy smokers than in non-smokers and in smokers of ⩽30 pack-years (table 3). The prevalence of COPD in never smokers was 6.1% (100 out of 1635 subjects), representing 25.9% of the subjects with COPD (100 of 386 subjects). Only 35% of the cases of COPD in never smokers had COPD GOLD stages II–IV (prevalence of GOLD II–IV in never smokers of 2.1%).

Table 4 shows the multiple logistic regression analysis of factors associated with COPD. The variables significantly associated with having COPD were older age, male gender, higher tobacco consumption and poor educational level.

Factors associated with previous diagnosis of COPD

A total of 26.9% of identified COPD cases had a previous diagnosis of COPD, ranging from 16% of those with mild disease to 35.1% of those with moderate and 85% of those with severe and very severe disease. Multiple logistic regression analysis of factors associated with previous diagnosis of COPD demonstrated that being older than 70, and having a smoking history of >30 pack-years, more severe disease and an impaired HRQL were associated with a higher probability of being diagnosed with COPD (table 4).

Impact of COPD on ADL and HRQL

A group of 343 (88.8%) patients with COPD, 172 (67.2%) subjects with GOLD stage 0 COPD and a control group of 380 consecutive non-COPD subjects agreed to answer the LCADL, EQ-5D and SGRQ questionnaires. Patients with COPD had impaired ADL and HRQL measured with both the generic and specific instruments. When we considered the patients with undiagnosed COPD, they also showed a statistically significant impairment in HRQL measured with the SGRQ and a statistically significantly worse VAS score in the EQ-5D (73.8 (16) vs 77.2 (16) in controls; $p<0.05$) with a preserved utility score. They also showed a statistically significant impairment in some dimensions of ADL: self-care, domestic and physical. In contrast, individuals with GOLD stage 0 had similar scores in the LCADL compared with non-COPD participants, but they also showed statistically significant impairment in the VAS EQ-5D and the SGRQ (table 5).

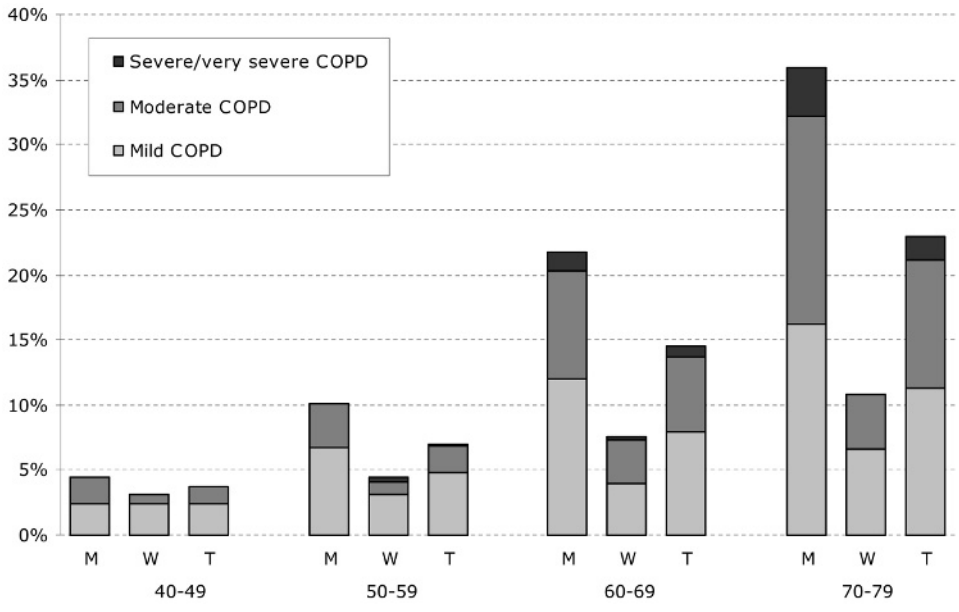

Figure 1 Chronic obstructive pulmonary disease (COPD) prevalence (postbronchodilator FEV_1/FVC (forced expiratory volume in 1 s/forced vital capacity) <0.70) and GOLD (Global Initiative for Chronic Obstructive Lung Disease) severity stages by gender and age group. M, men; W, women; T, total.

Table 2 COPD prevalence and COPD GOLD II+ prevalence and 95% CI according to gender and age group

	40–49 years	50–59 years	60–69 years	70–80 years	Total
COPD GOLD I–IV					
Men	4.4% (2.8% to 6.1%)	10.2% (7.6% to 12.8%)	21.7% (17.7% to 25.6%)	35.9% (30.5% to 41.4%)	15.1% (13.5% to 16.8%)
Women	3.2% (1.8% to 4.5%)	4.4% (2.8% to 6.1%)	7.5% (5.0% to 10.0%)	10.7% (7.3% to 14.1%)	5.6% (4.6% to 6.7%)
All	3.8% (2.7% to 4.8%)	7.0% (5.6% to 8.6%)	14.5% (12.1% to 16.8%)	22.8% (19.5% to 26.2%)	10.2% (9.2% to 11.1%)
COPD GOLD II–IV					
Men	2.1% (0.9% to 3.2%)	3.3% (1.8% to 4.9%)	9.8% (6.9% to 12.7%)	19.7% (15.1% to 24.2%)	7.1% (5.9% to 8.3%)
Women	0.8% (0.1% to 1.4%)	1.3% (0.4% to 2.2%)	3.5% (1.8% to 5.3%)	4.1% (1.9% to 6.3%)	2.0% (1.4% to 2.7%)
All	1.4% (0.7% to 2.0%)	2.2% (1.4% to 3.1%)	6.6% (4.9% to 8.3%)	11.6% (9.1% to 14.2%)	4.4% (3.8% to 5.1%)

The prevalence of respiratory symptoms in the total population, COPD and GOLD 0 COPD is presented in the Supplementary material.
COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease.

DISCUSSION

The results of this large epidemiological study have demonstrated an overall prevalence of GOLD-defined COPD in the Spanish population between 40 and 80 years of age of 10.2%. The prevalence is almost three times higher in men than in women and increases with age, cumulative tobacco consumption and low education level. Interestingly, only 27% of the cases detected reported a previous diagnosis of the disease, while the probability of being diagnosed increased with age, intensity of smoking, the severity of the disease and the impairment in HRQL. Even patients with undiagnosed COPD had a significant impairment in HRQL and in some ADL.

Our results are similar to the 9.1% prevalence of COPD obtained around 10 years ago in another epidemiological study using the old ERS criteria for COPD in Spain in subjects between 40 and 69 years of age.[3] Although the smoking prevalence among women has increased in Spain in the last decades,[14] it appears that the prevalence of COPD in women has not yet fully reflected this increase,[15] being 3.9% in 1998[3] and 5.6% in the current survey. The current findings are similar to those reported in a recent systematic review of epidemiological studies which concluded that the prevalence of physiologically defined COPD in adults aged ⩾40 years worldwide ranges around 9–10%.[1] However, the BOLD initiative has reported significant differences between countries, ranging from 11.4% in China to 26.1% in Austria.[16] These differences may be related, at least in part, to differences in genetic background, smoking habits and exposure to other environmental risk factors, and are accompanied by differences in diagnostic rates and in management of the disease around the world.[17] The COPD prevalence observed in our study fits in the low range, but is higher than the 7.8% observed in Mexico,[18] 8.9% in Colombia[19] and 8.2% reported in another large study in China.[20]

There are controversies over the use of the GOLD definition for COPD, particularly in the elderly population as the FEV_1/FVC ratio falls with age[21]; therefore, using this definition may result in overdiagnosis of COPD.[22] However, we used this definition to be able to compare our results with the majority of recently published studies on COPD prevalence.[16 18–20] Another way of circumventing this problem is to consider the prevalence of GOLD stage II or higher COPD that requires a postbronchodilator FEV_1 <80% predicted. Considering this criterion, the prevalence dropped to 4.4%, within the range observed in some sites in the PLATINO study (2.6% in Mexico and 5.7% in Caracas and Sao Paulo)[18] but clearly below the mean prevalence of 10.1% observed in BOLD.[16] These differences justify the need to conduct studies to investigate the local prevalence of COPD in different countries or geographic areas.

The main risk factors for COPD identified in our study were older age, increased tobacco consumption and low educational level. However, there were 6.1% of never smokers who fulfilled the thresholds of airflow obstruction compatible with a definition of COPD, who represented 26% of the COPD cases detected. This is similar to the prevalence of 5.2% in never smokers in Colombia who also represented 30% of their COPD cases[19] and in line with the calculated 23% of the burden of COPD attributed to never smokers.[23] It is of note that most non-smokers among subjects identified as having COPD are elderly subjects

Table 3 Chronic obstructive pulmonary disease (COPD) prevalence according to smoking history

			Pack-years (smokers and ex-smokers)			
Gender	Age group	Non-smokers	1–14	15–30	>30	Total (smokers and ex)
Men	40–49	3/153 (2.0)	6/152 (4.0)	10/197 (5.1)	7/83 (8.4)	23/432 (5.3)
	OR (95% CI)	1	2.1 (0.5 to 8.6)	2.7 (0.7 to 10.0)	4.6 (1.2 to 18.3)	2.8 (0.8 to 9.5)
	50–59	5/134 (3.7)	4/100 (4.0)	16/135 (11.9)	26/139 (18.7)	46/374 (12.3)
	OR (95% CI)	1	1.1 (0.3 to 4.2)	3.5 (1.2 to 9.8)	5.9 (2.2 to 15.9)	3.6 (1.4 to 9.3)
	60–69	10/114 (8.8)	7/59 (11.9)	18/87 (20.7)	54/147 (36.7)	79/293 (27.0)
	OR (95% CI)	1	1.4 (0.3 to 2.1)	2.7 (1.2 to 6.2)	6.0 (2.9 to 12.5)	3.8 (1.9 to 7.6)
	70–80	19/88 (21.6)	7/38 (18.4)	22/53 (41.5)	58/116 (50.0)	87/207 (42.0)
	OR (95% CI)	1	0.8 (0.3 to 2.1)	2.6 (1.2 to 5.5)	3.6 (1.9 to 6.7)	2.6 (1.5 to 4.6)
Women	40–49	4/223 (1.8)	1/178 (0.6)	12/214 (5.6)	4/44 (9.1)	17/436 (3.9)
	OR (95% CI)	1	0.3 (0 to 2.7)	3.3 (1.0 to 10.0)	5.5 (1.3 to 22.9)	2.2 (0.7 to 6.6)
	50–59	11/318 (3.5)	2/118 (1.7)	7/115 (6.1)	7/55 (12.7)	16/288 (5.6)
	OR (95% CI)	1	0.5 (0.1 to 2.3)	1.8 (0.7 to 4.8)	4.1 (1.5 to 11.1)	1.6 (0.7 to 3.5)
	60–69	24/322 (7.5)	2/33 (6.1)	1/40 (2.5)	5/27 (18.5)	8/100 (8.0)
	OR (95% CI)	1	0.8 (0.2 to 3.5)	0.3 (0 to 2.3)	2.9 (1.0 to 8.1)	1.1 (0.5 to 2.5)
	70–80	24/283 (8.5)	2/15 (13.3)	3/8 (37.5)	5/10 (50.0)	10/33 (30.3)
	OR (95% CI)	1	1.7 (0.4 to 8.0)	6.5 (1.5 to 29.0)	10.8 (2.9 to 40.0)	4.7 (2.0 to 11.0)

Table 4 Chronic obstructive pulmonary disease (COPD) risk factors and factors associated with previous diagnosis of COPD: multiple logistic regression analysis

	COPD risk factors	Factors associated with previous diagnosis of COPD
Variable	**OR (95% CI)**	**OR (95% CI)**
Age:		
50–59 years	1.7 (1.1 to 2.5)	4.2 (0.9 to 17.7)
60–69 years	4.0 (2.7 to 5.8)	3.9 (0.9 to 16.0)
70–80 years	7.6 (5.1 to 11.2)	6.4 (1.6 to 25.2)
Gender, men	1.9 (1.4 to 2.5)	1.9 (0.8 to 4.5)
Smoking:		
1–14 pack-years	1.0 (0.68 to 1.6)	0.4 (0.06 to 2.2)
15–30 pack-years	2.6 (1.86 to 3.7)	1.5 (0.5 to 4.7)
More than 30 pack-years	5.1 (3.69 to 7.1)	3.1 (1.2 to 7.9)
Education:		
Less than primary school	1.6 (1.1 to 2.5)	0.7 (0.2 to 2.1)
Primary school	1.3 (0.9 to 1.8)	0.6 (0.3 to 1.6)
Secondary school	1.1 (0.8 to 1.5)	0.5 (0.2 to 1.4)
Severity of COPD:		
GOLD II	NA (NA)	1.9 (1.0 to 3.6)
GOLD III–IV		16.7 (3.9 to 70.8)
SGRQ:		
5–17 units (second tertile)	NA (NA)	4.7 (1.3 to 17.5)
More than 17 units (third tertile)		11.4 (3.1 to 41.2)

Reference categories: age, between 40 and 49 years; gender, female; never smoker; education, University degree.
Severity of COPD: GOLD I; SGRQ <5 units (first tertile).
GOLD, Global Initiative for Chronic Obstructive Lung Disease; SGRQ, Saint George's Respiratory Questionnaire.

with mild COPD.[5 20 22 23] In fact, the population-attributable risk due to smoking in COPD is almost 80% in those aged 60–62 years but decreases in the elderly.[24] The probable explanation for the decreased importance of smoking in COPD in the ageing is the use of the fixed ratio for the definition of airway obstruction.

The presence of chronic symptoms (cough and sputum production) in a smoker without airflow obstruction was labelled as GOLD stage 0 COPD in the previous GOLD guidelines. In our study, 6.7% of individuals fulfilled this criterion. Interestingly, a novel finding of our study was that GOLD stage 0 participants presented a significant impairment in HRQL without impairment in ADL, compared with a control population without COPD. The relevance of GOLD stage 0 has been questioned since it does not always represent the first step in the development of COPD[25] and, in fact, it has not been included in the last edition of the GOLD guidelines.[2]

Only 27% of the identified cases reported a previous diagnosis consistent with COPD. This percentage is slightly higher than the 21.8% observed in 1998 in Spain[5] and is in accordance with other studies around the globe—that is, 20% in the UK,[26] 19% in Greece,[27] 11.3% in Latin America[28] or even 9.4% in Japan.[29] Although undiagnosed patients had a milder airflow obstruction, remarkably they had a significant impairment in HRQL and reduced levels of ADL. Both HRQL and level of physical activity are not only markers of "well-being" but also important predictors of survival in patients with COPD.[30 31] These results suggest that, at least in some cases, undiagnosed patients represent earlier disease compared with diagnosed individuals and highlight the importance of early recognition of the disease

Table 5 Results of the LCADL, EQ-5D and SGRQ questionnaires in patients with chronic obstructive pulmonary disease (COPD) according to previous diagnosis, stage 0 COPD and control subjects

Mean (95% CI)	Control (n = 378)	Stage 0 (n = 172)	Diagnosed COPD (n = 100)	Undiagnosed COPD (n = 235)	All COPD (n = 335)
LCADL					
Total	15.7 (15.3 to 16.0)	15.8 (15.2 to 16.5)	19.1(17.4 to 20.8)***	15.6 (15.0 to 16.2)	16.6 (16.0 to 17.3)*
Self-care	4.2 (4.1 to 4.2)	4.2 (4.1 to 4.3)	5.3 (4.9 to 5.7)***	4.4 (4.3 to 4.6)*	4.7 (4.5 to 4.8)***
Domestic	5.9 (5.7 to 6.1)	5.8 (5.4 to 6.2)	6.2 (5.1 to 7.3)*	5.2 (4.8 to 5.6)*	5.5 (5.1 to 5.9)
Physical	2.5 (2.4 to 2.6)	2.7 (2.6 to 2.9)	3.9 (3.6 to 4.2)***	2.8 (2.7 to 2.9)*	3.1 (3.0 to 3.3)***
Leisure	3.1 (3.0 to 3.1)	3.1 (3.0 to 3.2)	3.7 (3.4 to 3.9)***	3.1 (3.1 to 3.2)	3.3 (3.2 to 3.4)***
EQ-5D					
VAS score	77.2 (75.6 to 78.8)	72.0 (69.5 to 74.5)***	64.0 (55.8 to 72.1)***	73.9 (71.8 to 75.9)*	70.9 (69.1 to 72.7)***
Utility score	0.90 (0.85 to 0.95)	0.88 (0.81 to 0.95)	0.77 (0.66 to 0.88)***	0.90 (0.84 to 0.96)	0.86 (0.81 to 0.91)*
SGRQ					
Total	8.8 (7.6 to 10.0)	17.0 (15.0 to 19.0)***	34.3 (24.8 to 43.8)***	15.6 (13.8 to 17.4)***	21.2 (19.2 to 23.2)***
Symptoms	11.1 (9.7 to 12.5)	31.7 (29.2 to 34.2)**	41.8 (31.5 to 52.1)***	20.3 (17.9 to 22.7)***	26.7 (24.3 to 29.1)***
Activity	12.6 (10.7 to 14.5)	20.1 (17.2 to 23.0)**	46.6 (34.4 to 58.8)***	22.6 (19.8 to 25.4)***	29.7 (27.0 to 32.4)***
Impact	5.6 (4.6 to 6.6)	9.9 (8.1 to 11.7)***	24.6 (15.0 to 34.2)***	9.6 (8.0 to 11.2)***	14.1 (12.3 to 15.9)***

*p<0.05; **p<0.01; ***p<0.001 in the comparisons vs control, except the group of those diagnosed with COPD that was compared with those with undiagnosed COPD.
EQ-5D, EuroQol 5 Dimensions questionnaire; LCADL, London Chest Activities of Daily Living; SGRQ, Saint George's Respiratory Questionnaire; VAS, visual analogue scale.

and the need for extensive use of spirometry in order to decrease the burden of undiagnosed airflow obstruction in the community.[32] Interestingly, in a previous survey, only 42.6% of adults who consulted a doctor in Spain for chronic respiratory symptoms underwent spirometry,[33] and programmes of office spirometry have been hampered by the lack of expertise, time and motivation of primary care physicians.[34 35]

In summary, the current study has found a prevalence of GOLD-defined COPD of 10.2% in Spain, with a large proportion of undiagnosed disease. Despite having milder obstruction, patients with undiagnosed COPD have a significant impairment in HRQL and physical activities. Early detection of COPD is still an unresolved issue.

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