Original Research

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Performance study of a new diagnostic questionnaire for (Chronic obstructive pulmonary disease) COPD with information on exposure to wood smoke, COPD-WS

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ABSTRACT

Background: To determine the diagnostic performance of a new questionnaire (COPD-WS) that considers also exposure to wood smoke for diagnosing Chronic Obstructive Pulmonary Disease (COPD) in a Colombian population.

Methods: A cross-sectional study was conducted with analysis of diagnostic tests in subjects with and without COPD. Clinical variables were selected based on their relevance to COPD diagnosis, including age, sex, smoking status, exposure to wood smoke, dyspnea, cough, chronic expectoration, and wheezing. A bivariate analysis was performed with the diagnosis of COPD by spirometric criteria. The area under the receiver operating characteristic curve (AUROC) was calculated for the new questionnaire and compared with the LFQ, CDQ, PUMA, COULD IT BE COPD, and COPD-PS questionnaires. The cutoff point for the new questionnaire was obtained through the Youden index, and a p-value <0.05 was considered statistically significant.

Results: A total of 681 patients were included, 187 (27.5%) diagnosed with COPD. The mean age of the population was 65.9 (SD: ±11.79) years, with 53.7% being women and 58.3% having been exposed to wood smoke. The variables included in the questionnaire were age, sex, smoking status, exposure to wood smoke, dyspnea, cough, chronic expectoration, and wheezing. The AUROC for the new COPD-WS questionnaire was 0.69 (95%CI:0.65-0.74;p<0.001), and for a cutoff point ≥6, sensitivity was 0.711 (95%CI:0.677-0.745), specificity was 0.575 (95%CI:0.538-0.612), PPV was 0.388 (95% CI:0.351-0.424), NPV was 0.840 (95%CI:0.813-0.868), LR+ was 1.673 (95%CI:1.458-1.919), LR– was 0.502 (95% CI:0.438-0.576).

Conclusion: This new questionnaire COPD-WS demonstrates acceptable diagnostic capability for diagnosis of COPD in this symptomatic population, and its performance is comparable to other questionnaires currently in use.

Key words: COPD, Wood smoke, Exposure, Performance

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Ethics approval and consent to participate: The study was conducted in accordance with the principles of the current Helsinki Declaration, as well as local, regional, and international regulations pertaining to clinical research, including Colombian Law on Biomedical Research. Ethical approval was obtained from the Medical Ethics Committee of the Clínica Universidad de La Sabana

(approval number 11052025). Prior to participating in the study, all participants provided written informed consent, and the confidentiality of their data was strictly maintained throughout the study.

Consent for publication: Not applicable.

Availability of data and material: Data are available on request to the corresponding author.

Conflict of interest: The authors have no disclosures to report.

Funding: This work was supported by Universidad de La Sabana grant number MED-263-2019.

Acknowledgements: The study was carried out at the Universidad de La Sabana.

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most prevalent noncommunicable diseases and represents a challenge for global public health, with a growing burden of morbidity and mortality. According to data from 2019, this condition caused 3.23 million deaths, making it the third leading cause of death worldwide [1,2]. In 2016, the Latin American study PUMA showed a COPD prevalence in an at-risk population visiting primary care in Colombia of 21.8% COPD [3]. At the national level, results from the PREPOCOL study (Prevalence of COPD in Colombia) demonstrate an overall prevalence of 8.9% for 2008 [4]. A third of COPD cases occur in populations not exposed to tobacco smoke. It is known that among the multiple associated factors, chronic exposure to biomass fuels, such as wood burning, has been identified as a significant cause of the disease, particularly in developing countries, where approximately 40 to 70% of the population has used biomass fuels for cooking or heating homes in rural areas [5,6].

Smoking, exposure to wood smoke, and occupational exposure to fine particles cause inflammatory and structural changes in the lung parenchyma [7] and play a significant role in the development of chronic respiratory diseases. While COPD is conventionally associated with smoking, biomass exposure is linked to the presence of fine particles and chemical pollutants in the air, also contributing to the development and progression of COPD, particularly in developing countries [8–10]. Additionally, women are more exposed to wood smoke due to social and cultural habits [9,10]. The PREPOCOL study showed that 61% of the population has been exposed to wood smoke, with 39% using it for more than 10 years, becoming an independent risk factor for developing COPD, even after adjustment for other factors such as age, sex, education level, and occupational exposure [4,6].

Despite current knowledge, there is still underdiagnosis of the disease, particularly in early or asymptomatic stages, which limits the identification of these patients [11,12]. Currently, the LFQ (Lung Function Questionnaire), CDQ (COPD Diagnostic Questionnaire), PUMA, COULD IT BE COPD, and COPD PS (COPD Population Screener Questionnaire) are designed to identify individuals at elevated risk of developing COPD, using sociodemographic characteristics, anthropometrics, symptoms, and smoking history. However, none of them integrates the wood smoke exposure factor, which could result in a systematic underestimation of the true prevalence of COPD caused by wood smoke exposure, as well as in late detection of patients who could benefit from early preventive and therapeutic interventions; especially in places where this exposure is frequent.

Early diagnosis of COPD remains a major challenge, as the disease often goes undetected until it is at a more advanced stage, particularly in resource-limited settings. Screening tools such as questionnaires have been proposed to help identify individuals at risk, especially in primary care or low-complexity settings where access to spirometry is limited. Evidence suggests that targeted screening in high-risk populations—such

as those with a history of smoking or biomass exposure—may facilitate earlier diagnosis and intervention [13-15]. However, the role of questionnaires and even office spirometry in population-level screening remains controversial and is not currently recommended for asymptomatic individuals [16]. Therefore, the development of a new questionnaire such as the COPD-WS (Chronic Obstructive Pulmonary Disease Questionnaire with Wood Smoke Exposure Information) questionnaire must be interpreted within the context of targeted case-finding strategies rather than general population screening.

Since the diagnostic performance of questionnaires in detecting COPD related to wood smoke exposure remains unknown, this study aims to evaluate a newly developed tool specifically designed to address this gap. The COPD-WS questionnaire incorporates wood smoke exposure as a key risk factor, often overlooked in existing tools, and is tailored for use in Latin American populations. By developing and validating the COPD-WS, our goal is to provide a more sensitive tool for the early identification of COPD patients in Colombia.

Methods

A retrospective cross-sectional study with diagnostic test analysis was conducted in subjects undergoing pulmonary function tests in the outpatient department of a third-level clinic in Colombia. This study included patients evaluated between January 2015 and March 2020 using a retrospective review of pulmonary function test records. After identifying eligible patients, those who met the inclusion criteria were contacted to obtain informed consent and were invited to complete the study questionnaires.

Selection criteria

Subjects aged 40 years and older were included if they had undergone spirometry during routine clinical evaluation between January 2015 and March 2020, regardless of the spirometry outcome. All participants were required to provide informed consent and to have completed the study questionnaires in their entirety. Based on the post-bronchodilator spirometry results, participants were subsequently classified as having COPD (forced expiratory volume in one second / forced vital capacity (FEV_1/FVC) < 0.7 according to GOLD 2024 criteria) [17] or not having COPD. This allowed for comparison between cases and non-cases to assess the diagnostic performance of the COPD-WS questionnaire. Subjects were excluded if their spirometry did not meet quality criteria based on the American Thoracic Society (ATS) guidelines or if data on respiratory symptoms were missing.

Variables

Initially, identification and sociodemographic variables such as age, sex, educational level, presence of respiratory symptoms, smoking history (classified as current smokers, former smokers, or never smokers), exposure to wood smoke, and history of COPD or asthma were collected. Spirometric variables considered were weight, height, FVC, FEV_1, and FEV_1/FVC ratio. Additionally, the following 5 questionnaires were administered: LFQ [18,19], CDQ [16], PUMA [3,20], COULD IT BE COPD [21], and COPD-PS [22].

For the development of the COPD-WS questionnaire, clinically relevant variables were selected concerning the diagnosis of the disease, such as age, sex, smoking and biomass exposure history, and the presence of respiratory symptoms.

Study procedure

The study was conducted in two phases. In the first phase, medical records from January 2015 to March 2020 were reviewed to identify patients who had undergone spirometry and met the inclusion criteria. In the second phase, these patients were contacted by the research team, and those who agreed to participate were asked to complete the questionnaires and provide sociodemographic and clinical information. This procedure ensured that spirometry had already been performed before the administration of the diagnostic questionnaires, which reflects real-world conditions and avoids influencing spirometry outcomes.

Sample size

To calculate the sample size, the method proposed by Hanley and McNeil [23] was used to estimate an AUROC curve (area under the receiver operating characteristic curve). A COPD prevalence in Colombia of 21.8% was considered, according to the PUMA study conducted in Latin America in 2016 [3]. The AUROC value was taken as the lowest value found by Bastidas et al., in a study on the Colombian population [24]. For a 95% confidence interval and a precision of 5%, a minimum of 495 subjects was required.

Data was collected using the electronic data capture tools (REDCAP) provided by the University of La Sabana [25,26]. Subsequently, they were verified by the research team. The analysis was conducted using the SPSS statistical program (25, IBM Corp., Chicago, IL, USA). Qualitative variables were summarized in frequencies and percentages. Quantitative variables were summarized in means and standard deviations if the distribution was normal, or medians and interquartile ranges if the distribution was non-normal. Bivariate analysis was performed between the study variables and the presence or absence of COPD using the chi-square test for qualitative variables and the Student's t-test or Mann-Whitney U test based on the distribution of the quantitative variables. The normality of the variables was assessed using the Shapiro-Wilk test.

Relevant and plausible variables associated with disease diagnosis were selected, and a bivariate analysis was conducted to assess the presence or absence of COPD according to spirometric criteria. To identify the variables and their respective values included in the COPD-WS, the highest crude and adjusted Odds Ratios (ORs) were selected using a logistic regression model, as detailed in supplementary file 1 (Table S1, Table S2). Afterward, the performance of the new questionnaire was evaluated by calculating sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and the area under the receiver operating characteristic curve (AUROC), comparing it with the LFQ, CDQ, PUMA, COULD IT BE COPD and COPD-PS questionnaires. An AUROC of 0.5 indicated no discriminatory capacity, 0.51 to 0.60 indicated nearly no discriminatory capacity, 0.61 to 0.69 indicated regular discriminatory capacity, 0.7 to 0.8 indicated acceptable discriminatory capacity, 0.8 to 0.9 indicated excellent discriminatory capacity, and above 0.9 indicated outstanding discriminatory capacity. The optimal cutoff point was determined using the Youden index. A p-value <0.05 was considered significant for all estimations performed.

Ethics approval

This study involves human participants and was conducted according to the declaration of Helsinki, approved by the Institutional Ethics Committee of the Clínica Universidad de La Sabana.

Results

Out of 2,199 potentially eligible subjects, 681 patients who met the inclusion criteria were included in the final analysis, as shown in Figure 1.

General population characteristics

In our cohort, a prevalence of COPD of 27.5% was shown. The mean age was 65.9 years (SD±11.79), and 53.7% (366/681) were women (Table 1). Regarding smoking exposure, 44.7% (304/681) of participants reported a history of smoking, with no statistically significant difference between those with

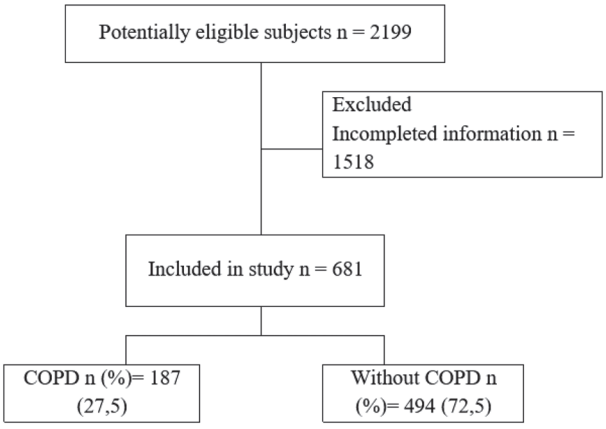

Figure 1. Flowchart. Notes: COPD, chronic obstructive pulmonary disease.

COPD (49.7%) and those without COPD (42.7%) (p = 0.100) (Table 2). However, individuals with COPD began smoking at a younger age (mean 18.1 years, SD ±6.11) compared to those without COPD (mean 19.4 years, SD ±6.96; p = 0.017), and reported a later age of smoking cessation (mean 43.9 vs. 41.1 years; p = 0.045). The average number of cigarettes smoked per day was also higher among COPD patients (12.5 vs. 10.4; p = 0.044), as well as the cumulative smoking index measured in pack/years, with 19.4 (SD ±27.65) in the COPD group compared to 14.2 (SD ±25.26) in non-COPD individuals (p = 0.020). There were no significant differences in reported passive smoking exposure between groups (19.3% vs. 22.1%; p = 0.423).

Of the total population, 58.3% (397/681) reported a history of exposure to wood smoke, with an average exposure duration of 24.5 years (SD±19.57) (Table 2). When comparing groups, exposure was significantly

Table 1. Baseline Demographic Characteristics.

	COPD n = 187	Without COPD n = 494	p value*
Age in years, m(sd)	70.8 (11.12)	64 (11.5)	<**0.001**
Male sex, n(%)	114 (61)	201 (40.7)	<**0.001**
Years of study, m(sd)	6.8 (5.54)	8.7 (5.56)	<**0.001**

Notes: m, mean; sd, standard deviation; COPD, chronic obstructive pulmonary disease. *: p values correspond to comparisons between the COPD and non-COPD groups.

Table 2. General characteristics of the population.

	COPD n = 187	Without COPD n = 494	p value*
History of exposure			
Smoking history, n(%)	93 (49.7)	211 (42.7)	0.100
Age at onset of smoking, m(sd)	18.1 (6.11)	19.4 (6.96)	**0.017**
Age at ending of smoking, m(sd)	43.9 (16.22)	41.1 (16.61)	**0.045**
Cigarettes per day, m(sd)	12.5 (11.25)	10.4 (12.25)	**0.044**
Pack/years m(sd)	19.4 (27.65)	14.2 (25.26)	**0.020**
Passive smoker, n(%)	36 (19.3)	109 (22.1)	0.423
Number of cigarettes per day of the person who smokes, m(sd)	14.1 (11.63)	15.8 (15.84)	0.126
Years of cohabitation with the person who smokes, m(sd)	21.4 (14.48)	27.8 (17.64)	<**0.001**
Exposure to wood smoke, n(%)	129 (69)	268 (54.3)	**0.001**
Hours of exposure to wood smoke per day, m(sd)	6.7 (4.77)	6.8 (5.1)	0.810
Years of exposure to wood smoke, m(sd)	26.2 (21.33)	23.7 (18.67)	0.169
Medical History n(%)			
COPD, chronic bronchitis, or emphysema.	94 (50.3)	115 (23.3)	<**0.001**
Asthma	32 (17.1)	61 (12.3)	0.106
History of atopy	41 (21.9)	120 (24.3)	0.517
Symptoms, n(%)			
Respiratory symptoms. n(%)	164 (87.7)	405 (82)	0.072
Age of symptom onset, m(sd)	59.4 (18.1)	57.3 (15.32)	0.161
Cough and expectoration	92 (49.2)	195 (39.5)	0.022
Dyspnea	135 (72.2)	302 (61.1)	**0.007**
Wheezing	76 (40.6)	140 (28.3)	**0.002**

Notes: m, mean; sd, standard deviation; COPD, chronic obstructive pulmonary disease. *: p values correspond to comparisons between the COPD and non-COPD groups.

more frequent among patients with COPD (69%, 129/187) compared to those without COPD (54.3%, 268/494; *p*=0.001). However, the average number of hours of exposure per day was similar between both groups (6.7 hours, SD±4.77 in COPD vs. 6.8 hours, SD±5.1 in non-COPD; *p*=0.810), as was the total number of years of exposure (26.2 years, SD±21.33 vs. 23.7 years, SD±18.67; *p*=0.169).

Among patients diagnosed with COPD, males predominated at 61% vs 40.7% (p<0.001), with dyspnea present in 72.2% vs 61.1% (p=0.007), and cough with expectoration in 49.2% vs 39.5% (p=0.022) (Table 2).

Spirometric characteristics of the population

Regarding spirometric characteristics, the mean post-bronchodilator FEV_1/FVC ratio was 59.8% (SD ± 8.4) in subjects with COPD and 79% (SD ± 5.34) in subjects without COPD (p<0.001) (see supplementary file, Table S1 and Table S2). The post-bronchodilator FEV_1 was 1.8 liters (SD ± 0.64) in patients with COPD, compared to 2.4 liters (SD ± 0.76) in patients without the disease (p<0.001).

Construction and performance of the new COPD-WS questionnaire

Table 3 describes the variables included in the COPD-WS questionnaire; each variable has a value between 0 and 2 points, obtained through the analysis of the ORs. Finally, the COPD-WS questionnaire can range from 0 to 16 points. A score ≥6 on the COPD-WS questionnaire showed an AUROC of 69.3 (95% CI: 65-74; p <0.001) for the diagnosis of COPD, with a sensitivity of 71.1 (95% CI: 67.7 – 74.5), specificity of 57.5 (95% CI 53.8- 61.2), PPV of 38.8 (95% CI 35.1-42.4), NPV of 84 (95% CI 81.3 – 86.8), LR+ of 1.673 (95% CI: 1.458-1.919), LR– of 0.502 (95% CI: 0.438-0.576) (Figure 2).

Comparison with other questionnaires for the diagnosis of COPD

Contrasting the operational characteristics of COPD-WS with the results of a previous study comparing the diagnostic performance of 5 questionnaires for COPD diagnosis in a similar population [21], the questionnaires with the highest sensitivity were COPD-PS (78.6%, 95% CI 75.5-87.5), CDQ (78.6%, 95% CI: 75.5-81.7), and COPD-WS (71.1%, 95% CI 67.7 – 74.5). The highest negative predictive values were observed in COPD-PS (84.6%, 95% CI 76.7-92.4), COPD-WS (84%, 95% CI 81.3-86.8), and CDQ (81.6%, 95% CI 78.7-84.5). The questionnaires with the highest AUROC were COPD-WS (0.69, 95% CI: 0.65-0.74, p <0.001) and CDQ (0.68, 95% CI 0.64-0.73, p <0.001) (Table 4 and Figure 3).

Table 3. COPD WS questionnaire.

Variable	Score
Age	
35-49 years	0
50-59 years	1
60 - 69 or over 70 years	2
Sex	
Male	2
Female	0
Smoking - pack/year	
<20	0
20-30	1
>30	2
Wood smoke exposure	
Yes	2
No	0
Dyspnea	
Never/ Rarely	0
Sometimes	1
Most of the time/ All the time	2
Cough	
Frequently / Very frequently	2
Never / Rarely / Sometimes	0
Chronic expectoration	
Yes	2
No	0
Wheezing	
Frequently / Very frequently	2
Never / Rarely / Sometimes	0

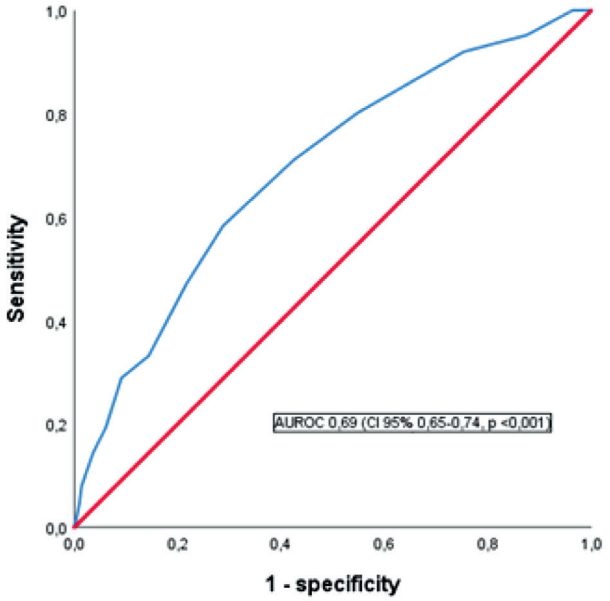

Figure 2. The area under the receiver operating characteristic curve for COPD-WS questionnaire.

Discussion

In this study, we have measured the performance of a new diagnostic questionnaire we developed, called COPD-WS, which incorporates the wood smoke exposure variable. Our findings show that this questionnaire has a diagnostic capability comparable to that of other questionnaires such as CDQ, PUMA, LFQ, COPD-PS, and COULD IT BE COPD. Additionally, our results demonstrate that COPD-WS is an adequate screening tool and works for detecting COPD patients, with high sensitivity to identify positive cases. It is highlighted that the new COPD-WS questionnaire has a high NPV; therefore, a score of less than 6 points could rule out the diagnosis of COPD. In our cohort, a prevalence of COPD of 27.5% was shown, with a higher proportion of women and a frequent prevalence of symptoms such as dyspnea and cough with expectoration. Similarly, it's worth noting that wood smoke exposure was more predominant than smoking among our study participants.

Environmental factors, such as tobacco and wood smoke exposure, play a decisive role in COPD development [7]. Heavy smoking has been widely identified in numerous studies as a significant risk factor for this disease. This has led to the creation of diagnostic questionnaires aimed at early detection of COPD; among these, the CDQ has shown an AUROC of 0.714, COPD-PS of 0.652, and LFQ of 0.669, indicating adequate diagnostic performance, as described by Dragonieri et al. [27], similar to the data described by Au-Doung et al., where an AUROC of 0.753 was reported for the PUMA [15], and by Sogbetun et al., who determined a similar discriminatory capacity between the questionnaires with an AUROC of 0.623 for COPD-PS and 0.655 for LFQ [28]. However, it is noteworthy that these questionnaires do not consider wood smoke exposure as a predictor variable for disease development. In this regard, implementing our questionnaire for screening patients exposed to biomass presents a novelty, offering a more comprehensive tool for risk assessment in this population.

The physio-pathological changes induced by wood smoke vary compared to smoking-associated COPD; wood smoke inhalation is characterized by a low-flow nasal breathing pattern, which restricts the penetration of pollutants [9,29], favoring a COPD phenotype that predominantly affects the airways, with little emphysema, so this population is more prone to airway hyperreactivity and bronchial thickening, as well as symptoms such as wheezing and rhonchi [30]. A point of divergence in COPD associated with wood smoke inhalation is genetic susceptibility and epigenetic modifications; certain single nucleotide polymorphisms (SNPs) are linked to COPD, particularly in non-smoking women chronically exposed to wood smoke, suggesting a genetic predisposition that affects this group more significantly than those exposed to cigarette smoke [9,29].

The inflammation induced by wood smoke is caused by the infiltration of neutrophils and macrophages into the airways, damage mediated by reactive oxygen species, and marked proteolytic activation in that area [31]. There are also differences in terms of pulmonary function tests; in wood smoke-induced COPD, a normal or slightly affected diffusion capacity (DL_{CO}) and DL_{CO} related to alveolar volume (DL_{CO}/VA) are observed compared to tobacco-induced COPD, where they are significantly decreased; this finding correlates with the lower proportion of emphysema in wood smoke-induced COPD [6,32].

The results of this study highlight the importance of considering wood smoke exposure as a

Table 4. Comparison with other questionnaires for the diagnosis of COPD.

	Se (CI 95%)	Sp (CI 95%)	PPV (CI 95%)	NPV (CI 95%)	LR+ (CI 95%)	LR- (CI 95%)	AUCOR (CI 95%)	p value
LFQ ≤18	60.1 (56.4-63.8)	19.3 (16.3-22.2)	66.3 (62.7-69.8)	15.5 (12.7-18.2)	1.34 (0.982-1.836)	0.48 (0.353-0.66)	0.66 (0.62-0.71)	<0.001
CDQ ≥16	78.6 (75.5-81.7)	47.4 (43.6-51.1)	42.8 (39-46.5)	81.6 (78.7-84.5)	1.49 (1.335-1.671)	0.45 (0.404-0.505)	0.68 (0.64-0.73)	<0.001
PUMA ≥5	58.8 (55.1-62.5)	64.2 (60.6-67.8)	38.3 (34.7-42)	80.5 (77.5-83.4)	1.64 (1.388-1.943)	0.64 (0.542-0.759)	0.67 (0.62-0.71)	<0.001
COULD It Be COPD ≥3	58,8 (55,1-62,5)	53.2 (49.5-57)	32.3 (28.7-35.8)	77.4 (74.2-80.5)	1.26 (1.08-1.465)	0.77 (0.664-0.901)	0.58 (0.53-0.63)	<0.001
COPD PS ≥4	78,6 (75,5-87,5)	44.3 (33.5-55.2)	34.8 (24.5-45.2)	84.6 (76.7-92.4)	1.41 (1.267-1.574)	0.48 (0.433-0.538)	0.65 (0.6-0.69)	0.001
COPD WS ≥6	71,1 (67,7-74,5)	57.5 (53.8-61.2)	38.8 (35.1-42.4)	84 (81.3-86.8)	1.67 (1.458-1.919)	0.5 (0.438-0.576)	0.69 (0.65-0.74)	<0.001

Notes: Se, sensitivity; Sp, specifcity; PPV, positive predictive value; NPV, negative predictive value; LR+, positive likelihood ratio; LR– , negative likelihood ratio; AUC, area under the receiver operating characteristic curve.

The LFQ questionnaire is calculated in reverse since its score is contrary to the other questionnaires

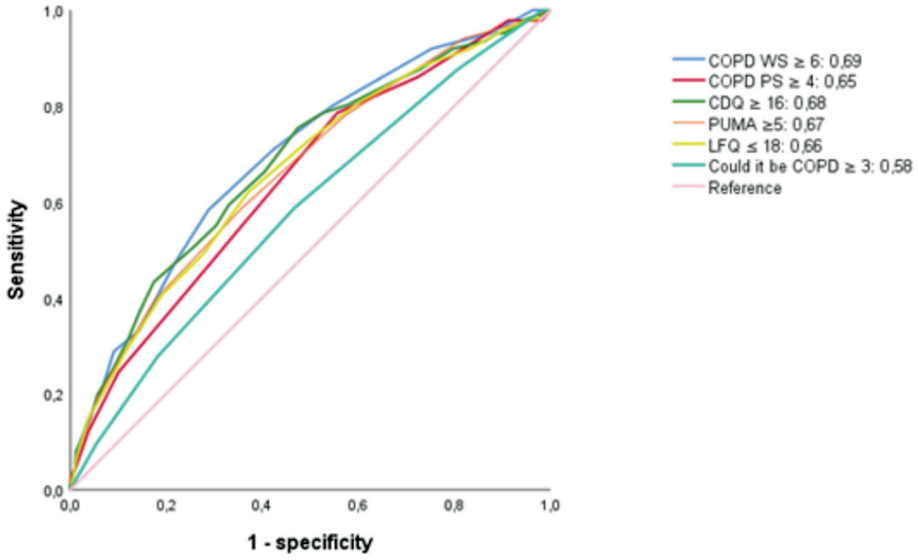

Figure 3. The area under the receiver operating characteristic curve for diagnostic questionnaires.

diagnostic factor for COPD and emphasize the need to integrate this information into screening questionnaires used in primary care and community settings. Additionally, they suggest the possibility of developing new screening tools that incorporate relevant environmental variables. Besides, in our population, access to spirometry and related healthcare services can be delayed, leading to significant wait times and potential delays in overall patient care. Therefore, the predictive model we developed holds value as an initial screening tool, helping to identify patients who may require further diagnostic evaluation, thus facilitating earlier intervention.

However, the study has some limitations. Firstly, it was a single-center retrospective study, which limits the external validity of its results. Furthermore, subjects were referred for spirometry in a region with exposure to wood smoke. This implies that the sample predominantly comprises older individuals with a high prevalence of respiratory symptoms and exposure to wood smoke, which could limit the generalizability of the results to younger populations or those with lower exposure to this risk factor. Further research is needed to validate the effectiveness and representativeness of the questionnaire in different clinical and population contexts.

Conclusions

The results obtained from the COPD-WS demonstrate an acceptable discriminatory capacity to identify patients with COPD in our study population, supporting its potential utility as a screening tool in clinical settings, particularly in regions where exposure to wood smoke is a prevalent risk factor, such as in Colombia. While the findings are promising, further studies are needed to assess its performance in high-risk populations beyond clinical settings, rather than in the general population, in line with current recommendations that do not support COPD screening in asymptomatic individuals.

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Received for publication: 7 November 2024 - Accepted for publication: 24 June 2025

Licensee Mattioli 1885, Italy
Multidisciplinary Respiratory Medicine 2025; 20: 1007
doi: 10.5826/mrm.2025.1007

APPENDIX

Supplementary files

Table S1. Association of variables and diagnosis of COPD.

	OR (IC 95%)	RR	p value	Adjusted OR (IC 95%)	p value
Age					
How old are you? Over 70	2.94	2.15	<0.001		
What is your age in years? Over 70	2.89	1.72	<0.001		
Over 60	3.19	2.46	<0.001		
How old are you? Over 60	3.34(2.13-5.22)	2.55	<0.001	3.34(2.08-5.38)	<0.001
Sex					
Male	2.12(1.5-2.98)	1.72	<0.001	2.06(1.42-3)	<0.001
Smoking					
What is the total number of years that you have smoked? More than 25 years	1,72	1,45	0.032		
Number of packages per year greater than 30	1.85(1.11-3.07)	1.51	0.036	1.34(0.77-2.36)	0.303
Are you currently a smoker or an ex-smoker?	1.42	1.29	0.040		
Have you smoked at least 100 cigarettes in your life?	1.48	1,32	0.024		
Wood smoke					
Exposed to wood smoke, n(%)	1.88(1.31-2.68)	1.59	<0.001	1.58(1.07-2.31)	0.021
Years exposed to wood smoke more than 20	1.52	1.34	0.059		
Dyspnea					
Dyspnea	1.65	1.45	0.007		
Do you run out of breath more easily than other people your age?	1,74	1,50	0.002		
During the last 4 weeks, how many times have you felt short of breath? Most of the time or all of the time?	2.2(1.52-3.19)	1.72	<0.001	1.84(1.22-2.78)	0.004
Cough					
How often do you cough up phlegm? Frequently or Very frequently?	2.17(1.47-3.21)	1.69	0.002	1.87(1.06-3.29)	0.031
Do you usually have cough and phlegm in the morning?	1.81	1.52	0.001		

	OR (IC 95%)	RR	p value	Adjusted OR (IC 95%)	p value
Do you ever cough up anything when you cough, like mucus or phlegm? Every day	1..90	1.55	0.005		
Expectoration					
Chronic expectoration	1.73(1.21-2.5)	1.54	<0.001	1.11(0.65-1.88)	0.713
Do you have phlegm or mucus most days?"	1.49	1.32	0.034		
Wheezing					
How often do you feel noises in your chest (wheezing, whistling, rattling) when you breathe?	2.02(1.36-3.02)	1.62	<0.001	1.56(0.98-2.49)	0.064
Do you experience wheezing?	1.74	1.48	0.002		

Notes: COPD, chronic obstructive pulmonary disease.

Table S2. Spirometric characteristics of the population.

	COPD n = 187	Without COPD n = 494	p value*
Weight Kilograms, m(sd)	69.3 (13.83)	72.1 (13.45)	**0.014**
Height centimeters, m(sd)	160.3 (9.1)	159.3 (9.29)	0.185
FVC pre B_2 L, m(sd)	2.8 (0.9)	3.1 (1.01)	<**0,001**
FVC post B_2 L, m(sd)	3 (0.96)	3.1 (0.97)	0.219
FEV_1 pre B_2 L, m(sd)	1.6 (0.62)	2.3 (0.75)	<**0.001**
FEV_1 post B_2 L, m(sd)	1.8 (0.64)	2.4 (0.76)	<**0.001**
FEV_1 % change, m(sd)	13.6 (13.79)	5.9 (7.33)	<**0.001**
FEV_1/FVC pre B_2, m(sd)	57.9 (10.04)	76 (6.58)	<**0.001**
FEV_1/FVC post B_2, m(sd)	59.8 (8.4)	79 (5.34)	<**0.001**
Z Score FVC pre B_2, m(sd)	-0.6 (1.53)	0 (1.59)	<**0.001**
Z Score FVC post B_2, m(sd)	-0.1 (1.68)	0 (1.27)	0.664
Z Score FEV_1 pre B_2, m(sd)	-2 (1.56)	-0.2 (1.42)	<**0.001**
Z Score FEV_1 post B_2, m(sd)	-1.5 (1.42)	0 (1.28)	<**0.001**
Z Score FEV_1/FVC pre B_2, m(sd)	-1.6 (1.05)	-0.2 (0.62)	<**0.001**
Z Score FEV_1/FVC post B_2, m(sd)	-1.4 (0.84)	0.1 (0.49)	<**0.001**

Notes: m: mean; sd, standard deviation; L, liters; B_2, Beta-2 agonists; FVC, Forced Vital Capacity; FEV_1, Forced Expiratory Volume in one second; COPD, chronic obstructive pulmonary disease. *: p values correspond to comparisons between the COPD and non-COPD groups.