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Assessment of Patient Satisfaction with Treatments for Chronic Obstructive Pulmonary Disease: a cross-sectional study

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Abstract

Purpose: Patient satisfaction with treatment is associated with adherence to therapy. This study aimed to investigate the treatment satisfaction level of patients with chronic obstructive pulmonary disease (COPD) and to explore the underlying factors associated with patient satisfaction.

Methods: A cross-sectional study was conducted in ambulatory patients at the Second Xiangya Hospital, Changsha, Hunan, between August 1, 2020, and May 31, 2021. The Treatment Satisfaction Questionnaire for Medication version II (TSQM v. II) was used to assess the treatment satisfaction of patients. Multivariable regression analysis was used to determine the factors associated with treatment satisfaction.

Results: 392 ambulatory patients with COPD first participated in the study, and 354 patients with are finally available. Median (IQR) score in effectiveness was 66.67(50.00, 66.67), in side effects was 100(100,100), in convenience was 66.67(66.67, 66.67), in global satisfaction was 66.67(50.00, 66.67). Compared with the unsatisfied group, the patients who were satisfied with the treatment had fewer acute exacerbations in the past year (0 vs 1, $P < 0.001$), lower CAT scores(10 vs 13, $P < 0.001$), lower CCQ scores(1.95 vs 2.24, $P < 0.001$), lower GOLD

group classification ($p < 0.001$) and lower BODE index [3.00(1.00, 4.25) vs 3.00(2.00, 5.00), $p=0.006$]. Results indicate that different bronchodilator treatment didn't impact the satisfaction with treatment. The multivariable regression analysis showed that global satisfaction was associated positively with mMRC ($\beta=2.814$, $P=0.027$), while inversely with BMI ($\beta=-0.542$, $P=0.014$), FEV1%predicted ($\beta=-0.135$, $P=0.024$), CAT score ($\beta=-0.342$, $P=0.033$), BODE index ($\beta=-2.057$, $P=0.023$).

Conclusion: The results of this study showed that the patients' satisfaction with treatments is not high in COPD. Different bronchodilator treatment didn't impact the satisfaction with treatment.

Keywords: chronic obstructive pulmonary disease, treatment satisfaction, TSQM v. II, bronchodilator

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is the most common chronic respiratory disease, which is characterized by persistent airflow limitation and respiratory symptoms^[1]. According to the 2015 Global Burden of Diseases, Injuries, and Risk Factors Study, the prevalent cases number of COPD increased by 44.2% to 174.5 million people from 1990 to 2015^[2]. COPD accounted for the largest number of deaths from chronic respiratory diseases in 2016^[3]. The World Health Organization (WHO) predicts that the prevalence of COPD will continue to rise in the next 40 years, and the number of deaths from COPD and related diseases will exceed 5.4 million per year by 2060^[4, 5].

Pharmacologic therapy for COPD can be used to relieve symptoms, reduce the frequency and severity of exacerbations, and improve exercise tolerance and health status^[6]. Bronchodilator is the core of pharmacologic treatment for COPD, and long-term regular medication treatment is an important part of disease control for patients^[1]. For chronic diseases such as COPD, high persistent treatment is a prerequisite for treatment success^[7]. However, evidence indicates that 40% to 60% of COPD patients do not adhere to their medications^[8, 9]. Poor adherence to medications is common in patients with COPD, which frequently leads to poor disease control and increased morbidity and mortality^[10-12]. Treatment satisfaction is defined as the patient's evaluation of the process of receiving treatment and related outcomes^[13]. Literature has shown that treatment satisfaction is associated with treatment adherence and persistence, and patients with better treatment satisfaction are more likely to persist in their medication and improve treatment^[14-16]. Treatment satisfaction has been shown to predict adherence^[16-18]. The Treatment Satisfaction Questionnaire for Medication version II (TSQM v. II) is a widely used and translated generic instrument to measure treatment satisfaction^[16, 18]. Particularly the global satisfaction subscale of TSQM v. II has been reported to predict both medication persistence and adherence in ambulatory patients^[17, 18]. TSQM-II has been used in China previously, and the Chinese *version* is also used in this study^[19].

In clinical practice, limited information is available on the treatment satisfaction and potential correlation with treatment satisfaction of patients with COPD. To address this information gap, we analyzed data from patient surveys collected from the Second Xiangya Hospital, Changsha. We explored patient demographics and characteristics associated with

treatment satisfaction and identify the potentially related factors. The results might provide insights and evidence for improving patient satisfaction and sharing decision management in clinical practice.

Materials and Methods

Study Design

This cross-sectional study of outpatients with COPD was conducted in the Outpatient Department of Respiratory and Critical Care Medicine, at the Second Xiangya Hospital, Central South University, Changsha, Hunan, between August 1, 2020, and May 31, 2021. The outpatients were surveyed during a routine treatment visit to the hospital. A researcher explained the study purpose at enrollment and all study participants wrote informed consents. Then all participants completed the written questionnaire that was expected to take approximately 5 min under the researchers' supervision. This study was approved by the institutional review board of the Second Xiangya Hospital of Central South University and conducted according to the Declaration of Helsinki (Registration number: LYF2021012).

Study Populations

All patients who met inclusion criteria were included. Based on the number of patients managed by the center participating in the study, the inclusion of 360 participants fulfilling the inclusion/exclusion criteria within the defined enrollment period was considered feasible. Inclusion criteria were as follows: (1) age ≥ 18 years; (2) confirmed diagnosis of COPD (defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2019 recommendations: spirometry with a ratio of the forced expiratory volume in 1 s to the forced vital capacity (FEV₁/FVC) lower than 0.70 after bronchodilator administration)^[20]; (3) treatment with bronchodilators at least 6 months; and (4) signed informed consent. Exclusion criteria were as follows: (1) never received COPD or treatment with bronchodilators less than 6 months; (2) unable to cooperate to complete questionnaires; (3) patients with severe cardiac, cerebral, hepatic, renal, and hematopoietic diseases, psychiatric disease and significant cognitive impairment other than respiratory diseases.

Data Collection

All study variables were recorded in the study database. Information was collected from physicians on patients' demographic and clinical characteristics. Demographic variables contained the following: age, gender, place of residence, living situation, education level, smoking status and smoking index, body mass index (BMI), etc. Clinical variables include exacerbations in the previous year, lung function, stage of disease, GOLD 2019 group classification, COPD assessment test (CAT), modified Medical Research Council (mMRC), COPD Control Questionnaire (CCQ), body mass index, airflow obstruction, dyspnea, exercise capacity (BODE) index, the type of bronchodilators, etc. Personal medication was obtained by hospital prescription history as well as patients' reports.

Questionnaires

Satisfaction with treatment for COPD was assessed with the TSQM v. II. The TSQM v. II

was translated by professional translators into Chinese. Physicians in this study were invited to proofread the Chinese and English versions of the questionnaires. The TSQM v. II includes 11 questions covering four scales of treatment satisfaction: effectiveness, side effects, convenience, and global satisfaction. Patients rate their experiences with treatment between “extremely dissatisfied” and “extremely satisfied” on five-point or seven-point Likert scales. The score in each domain ranges from 0 to 100. The scores were calculated according to the original study of Atkinson et al^[16, 18].

The mMRC was used to assess the degree of dyspnea^[20]. MMRC ≥ 2 was used as the threshold to distinguish tachypnea^[20]. CAT and CCQ were used to measure health status^[20, 21]. According to GOLD 2019, participants were classified into ABCD groups for disease severity. The BODE index predicted subsequent survival^[22, 23]. Airflow limitation severity was classified into four stages: mild (stage I), moderate (stage II), severe (stage III), or very severe (stage IV)^[20]. COPD acute exacerbation was defined as an acute deterioration of respiratory symptoms and requires additional treatment^[20].

Statistical analysis

Statistical analyses were performed using the IBM SPSS Statistics program (version 23). Continuous variables are presented as mean \pm standard deviation (SD) or median with interquartile ranges (IQR). For qualitative variables, frequency and percentage are presented. The Kolmogorov-Smirnov test was used to inspect the normality of continuous variables. For two-group comparison, the Student t-test for independent variables was used to analyze normally distributed variables, and the Mann–Whitney U-test was used to analyze variables with non-normal distributions. Qualitative variables were compared using the Chi-square test. For multi-group comparison, P values were derived from the Kruskal-Wallis test in continuous variables or Chi-square test in categorical variables (including Dunn-Bonferroni post hoc correction), respectively. Multivariable linear regression analysis was performed for baseline characteristics of the patients to identify factors associated with the global satisfaction of patients. The level of significance was set as a 2-sided P value less than 0.05.

Results

A total of 392 COPD patients were invited to participate in this study and complete the questionnaires. 354 (90% of the patients) valid questionnaires were collected for statistical analysis (20 questionnaires met the exclusion criteria, 18 individuals repeatedly filled out questionnaires) (Figure 1).

Demographics and baseline characteristics

The demographic and clinical characteristics of the 354 patients with COPD participating in the study are summarized in Table 1. Overall, the median age was 65 years, 88.7% were male, 62.4% were living in rural. The majority of patients were not living alone (94.9%), and only 27.1% had at least a senior high school education. Most people had a smoking history, including former smokers (31.1%) and current smokers (54.0%). The median smoking index was 40 pack-year. 28.8% of patients had comorbidities. 145 patients (41.0%) had at least one acute exacerbation in the previous year. The mean FEV₁ predicted was 53.02 \pm 1.06, and the

mean FEV1/FVC% was 46.37 ± 0.68 . Regarding the assessment of airflow limitation severity, patients were classified as stage I (10.5%), stage II (42.4%), stage III (35.0%), and stage IV (12.1%). As for disease severity, patients were classified as GOLD A (31.4%), GOLD B (33.6%), GOLD C (7.3%), and GOLD D (27.7%). Median (IQR) score in effectiveness was 66.67(50.00, 66.67), in side effects was 100(100,100), in convenience was 66.67(66.67, 66.67), in global satisfaction was 66.67(50.00, 66.67).

Satisfaction with current treatments

The frequency and percentage of the TSQM v. II effectiveness, side-effects, convenience, and overall satisfaction subscales for each treatment group are summarized in Table 2. Among patients with using bronchodilators, 89(25.1%) were using long-acting muscarinic antagonist (LAMA), 90(25.4%) were using inhaled corticosteroid combined with long-acting beta-agonist (ICS+LABA), 23(6.5%) were using long-acting beta-agonist combined with long-acting muscarinic antagonist (LABA+LAMA), and 152(42.9%) were using inhaled corticosteroid ICS+LABA+LAMA (Table 2). Regarding satisfaction with treatment for COPD, 61.3% of participants were satisfied with effectiveness, 91.2% were satisfied with side effects 83.1% were satisfied with convenience, 61.6% were satisfied with global satisfaction(Figure 2). However, satisfaction with treatment was similar in different medications.

Association of Satisfaction and Clinical Characteristics

As shown in Table 3, no significant differences were observed between satisfied patients and those who were unsatisfied with the treatment in their demographic characteristics and lung function. The unsatisfied group had more acute exacerbations in the previous year (1 vs 0, $p < 0.001$). Satisfaction was observed in 146(67%) patients without acute exacerbation in the previous year, while 72(33%) patients with less than 1 acute exacerbation in the previous year. The proportion of satisfied patients was different among GOLD classification: in GOLD A was 37.6%, in GOLD B was 34.9%, in GOLD C was 7.3%, and in GOLD D was 20.2%. Post hoc analyses showed statistically significant satisfaction in group A (37.6% vs 21.3%, $P < 0.05$) and D (20.2% vs 39.7%, $P < 0.05$). The satisfied group had lower scores on the CAT (10 vs 13, $P < 0.001$) and CCQ (1.95 vs 2.24, $P < 0.001$). The median (IQR) score of BODE in satisfied patients was 3.00(1.00,4.25), while in unsatisfied patients was 3.00(2.00-5.00), which was significantly different($P=0.006$).

Factors Influencing Patients' Satisfaction

Table 4 shows the results of the multivariable linear regressions used to determine the factors influencing patient satisfaction with all medications treatment. The results showed that BMI($\beta=-0.542$, $P=0.014$) and FEV1%predicted($\beta=-0.135$, $P=0.024$) were positively associated with patient satisfaction, whereas the degree of dyspnea (mMRC)($\beta=2.814$, $P=0.027$) was positively associated with patients satisfaction. The patient satisfaction was also inversely associated with the health status (CAT score) ($\beta=-0.342$, $P=0.033$), and the BODE index($\beta=-2.057$, $P=0.023$).

Discussion

COPD management requires patients to change behavior and lifestyle, such as smoking cessation, adherence to exercise therapy, and optimal medication compliance^[1, 8]. However, patients with COPD often confronted with poor long-term adherence to medications. In China, more than one-third of patients with COPD discontinue medications beyond 6 months^[24]. Patients who stopped medication at any time had significantly lower lung function and a significantly increased risk of exacerbations^[25-27]. Some patients only took medication when their symptoms were severe, the medication was stopped once their condition improved. Thus, physicians should inform the importance of regular medication, improve patient treatment compliance, and reduce the risk of exacerbations^[28]. In a study of patients with chronic diseases including pulmonary disease, patient satisfaction was the only factor associated with medication adherence^[29].

In China, the satisfaction with COPD treatment is unknown. The objective of this study was to survey the treatment satisfaction of patients with COPD and to explore the potentially relevant factors. The result showed that patients had low satisfaction scores for medication according to the questionnaire adopted. Although most patients were satisfied in terms of side effects and convenience, 38.7% were dissatisfied with the effectiveness of the medical treatment, and for global satisfaction, 38.4% were dissatisfied. The score of treatment satisfaction in patients with COPD was significantly lower than that in patients with other diseases^{[30][31]}. The kinds of medicine therapy were not associated with patient global satisfaction of treatment, which is the same as previous study^[32]. This information suggests that physicians should be aware that other determinants in the treatment plan may affect patients' satisfaction with treatment^[33, 34].

We compared the difference between the satisfied group and the unsatisfied group. Unsatisfied patients had higher CAT scores, more acute exacerbations in the past year, more proportion of GOLD D, higher CCQ scores, and more proportion of grade 4 in the BODE index. These indicated that patients with COPD who were not satisfied with treatment had a significantly worse health-related quality of life and higher risk of acute exacerbations, which is consistent with the previous study^[32]. There may be an association between higher satisfaction and quality of life^[35]. Therefore, in order to determine an appropriate treatment plan for patients with COPD, we should not only consider the severity of symptoms, the risk of acute exacerbations and other factors, but also provide individual guidance according to the individual preferences of patients^[1]. Patient satisfaction with treatment is largely affected by disease severity, treatment duration, treatment regimen, and other factors^[32, 36]. But there were no significant differences in lung function and COPD disease severity. Studies focusing on the relationship between airflow limitation and treatment satisfaction need to be further investigated.

The multivariate regression analysis revealed BMI, FEV1%pred, CAT, BODE index were negatively associated with patient global satisfaction with treatment. Obesity is associated with increased dyspnea and reduced 6-minute walking distance^[37, 38]. However, most studies have shown that low-weight patients with COPD have low exercise ability and a high risk of death^[39-41]. We should consider the appropriate BMI range for patients with COPD. FEV1%pred reflects the degree of airflow limitation in patients^[20]. A high CAT score is an independent risk factor for death in patients with COPD^[42]. BOED index can predict the prognosis of COPD patients^[22, 43]. Patients with severe disease may suffer more pain, the poor effect of drug treatment, poor

improvement of symptoms, resulting in low patient satisfaction^[35, 44-47]. However, the correlation between these indicators was limited in COPD patients. Dyspnea score (mMRC) was the only clinical parameter found to be positively associated with patient global satisfaction with treatment, which is contrary to the previous study^[32]. Further larger studies are needed to confirm or refute this finding.

Limitations

This study has several limitations. Firstly, this was an observational study with only one center and the sample was small, a multi-center study is needed in the future. Besides, it is also possible that patients who do complete the questionnaires represent a selection bias simply because those who respond, in comparison to those who do not respond, maybe more satisfied with their medication. In addition, given that medical treatment for the prevention of exacerbation in COPD patients is a life-long treatment; thus, satisfaction with the treatment for an even longer duration of time should be assessed. Furthermore, Data on patient socioeconomic factors were not collected or considered in analyses. Considering the descriptive methodological approach used in our study, further studies are needed to confirm our findings. Finally, the reliability and validity of the Chinese version of TSQM-II were not assessed.

Conclusion

COPD patients have a low degree of satisfaction with the current treatment, and many patients are not satisfied with the treatment. The control of clinical symptoms is a vital factor affecting satisfaction level in COPD patients.

Author Contributions

All authors made substantial contributions to design, data acquisition, or analysis and interpretation of data; took part in drafting the article or revising it critically for relevant intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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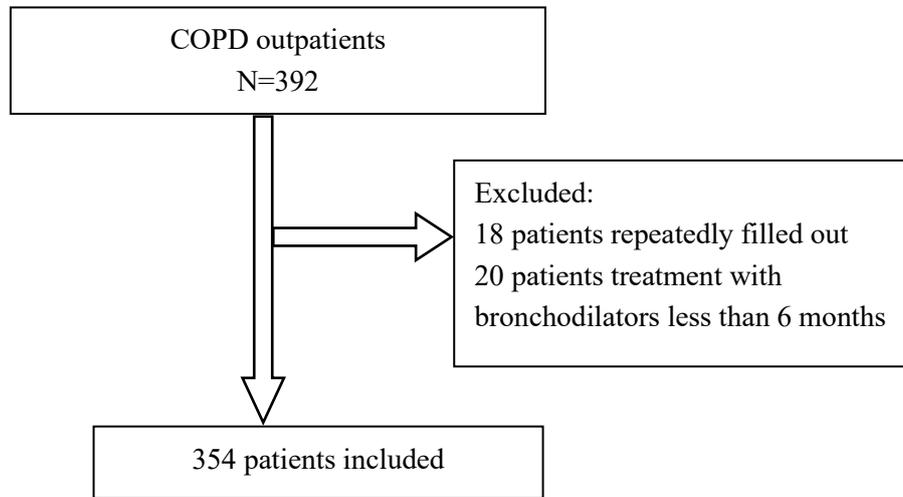
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Disclosure

The authors report no conflicts of interest in this work.

Figure 1. Study flow chart.



Abbreviation: COPD, chronic obstructive pulmonary disease.

Figure 2. The percentage of the each TSQM v. II subscales in patients with COPD

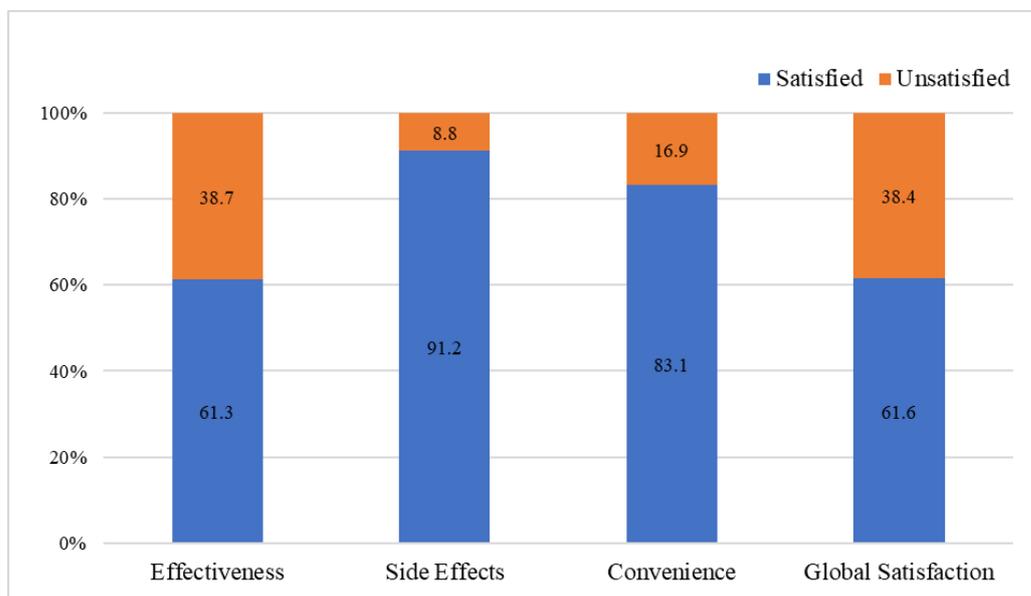


Table 1. Demographics and clinical characteristics of the patients

Characteristic	Total N= 354
Age, median(IQR), years	65(57, 74)
Gender, male, n(%)	314(88.7)
Place of residence, n(%)	
Rural	221(62.4)
Urban	133(37.6)
Living situation, n(%)	
Alone	18(5.1)
Not alone	336(94.9)
Education level, median(IQR), years	9(6, 9)
≤9, n(%)	258(72.9)
> 9, n(%)	96(27.1)
Smoking status, n(%)	
Never smoked	53(15.0)
Current smoker	110(31.1)
Former smoker	191(54.0)
Smoking index, median(IQR), pack-year	40(22, 60)
BMI, mean±SD, kg/m ²	22.59±0.20
<18.5, n(%)	54(15.3)
18.5-24, n(%)	173(48.9)
≥24, n(%)	127(35.9)
Comorbidity, yes, n(%)	102(28.8)
Exacerbations in previous year, median(IQR)	0(0, 1)
0, n(%)	209(59.0)
≥1, n(%)	145(41.0)
FEV1/FVC%, mean±SD	46.37±0.68
FEV1%predicted, mean±SD	53.02±1.06
COPD stage, n(%)	
Stage I	37(10.5)
Stage II	150(42.4)
Stage III	124(35.0)
Stage IV	43(12.1)
GOLD 2019 group classification, n(%)	
Group A	111(31.4)
Group B	119(33.6)
Group C	26(7.3)
Group D	98(27.7)
CAT score, median(IQR)	11(7, 17)
<10, n(%)	137(38.7)
≥10, n(%)	217(61.3)
mMRC score, median(IQR)	2(1, 2)
<2, n(%)	119(33.6)

Characteristic	Total N= 354
≥2, n(%)	235(66.4)
CCQ score, mean±SD	2.6±0.04
<1.5, n(%)	80(22.6)
≥1.5, n(%)	274(77.4)
BODE index, median(IQR)	3(1, 5)
1, n(%)	153(43.2)
2, n(%)	97(27.4)
3, n(%)	73(20.6)
4, n(%)	31(8.8)
TSQM v. II Effectiveness score	66.67(50.00, 66.67)
TSQM v. II Side effects score	100(100, 100)
TSQM v. II Convenience score	66.67(66.67, 66.67)
TSQM v. II Global satisfaction score	66.67(50, 66.67)

Notes: Data are presented as the mean±SD, median (IQR), or number (%).

Abbreviations: BMI, body mass index; BODE, body mass index, airflow obstruction, dyspnea, exercise capacity; CAT, COPD assessment test; CCQ, Clinical COPD questionnaire; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in one second; FVC, forced vital capacity; FEV1% predicted, forced expiratory volume in one second as a percentage of the predicted value; GOLD, Global Initiative for Chronic Obstructive Lung Disease; IQR, interquartile ranges; mMRC, Modified Medical Research Council Dyspnea Scale; N, number; SD; standard deviation; TSQM v. II Treatment Satisfaction Questionnaire for Medication version II.

Table 2. Treatment satisfaction of different medications in patients with COPD by TSQM v. II

Current medication	N(%)	TSQM v. II subscale, n(%)							
		Effectiveness		Side effects		Convenience		Global satisfaction	
		Satisfied	Unsatisfied	Satisfied	Unsatisfied	Satisfied	Unsatisfied	Satisfied	Unsatisfied
All	354(100)	217(61.3)	137(38.7)	323(91.2)	31(8.8)	294(83.1)	60(16.9)	218(61.6)	136(38.4)
LAMA	89(25.1)	54(24.9)	35(25.5)	86(26.6)	3(9.7)	73(24.8)	16(26.7)	55(25.2)	34(25.0)
ICS+LABA	90(25.4)	49(22.6)	41(29.9)	79(24.5)	11(35.5)	77(26.2)	13(21.7)	52(23.9)	38(27.9)
ICS+LABA+LAMA	152(42.9)	98(45.2)	54(39.4)	136(42.1)	16(51.6)	123(41.8)	29(48.3)	95(43.6)	57(41.9)
LABA+LAMA	23(6.5)	16(7.4)	7(5.1)	22(6.8)	1(3.2)	21(7.1)	2(3.3)	16(7.3)	7(5.1)

Notes: The Chi-square test showed $p>0.05$.

Abbreviations: COPD, chronic obstructive pulmonary disease; ICS, inhaled corticosteroid; LABA, long-acting beta-agonist; LAMA, long-acting muscarinic antagonist; TSQM v. II Treatment Satisfaction Questionnaire for Medication version II.

Table 3. Differences in clinical characteristics between patients with COPD by TSQM v. II global satisfaction score: satisfied versus unsatisfied

	Satisfied, N=136	Unsatisfied, N=218	<i>P-value</i>
Age, median(IQR), years	65.0(57.0, 69.0)	64.0(57.0, 70.0)	0.786
Male, n(%)	194(89.0)	120(88.2)	0.864
Place of residence, n(%)			0.822
Rural	135(61.9)	86(63.2)	
Urban	83(38.1)	50(36.8)	
Living situation, n(%)			0.140
Alone	10(7.4)	8(3.7)	
Not alone	126(92.6)	210(96.3)	
Education level, median(IQR), years	9(6, 12)	9(5, 12)	0.646
≤9, n(%)	161(73.9)	97(71.3)	0.624
> 9, n(%)	57(26.1)	39(28.7)	
Smoking status, n(%)			0.121
Never	29(13.3)	24 (17.6)	
Current smoker	62(28.4)	48 (35.3)	
Former smoker	127(58.3)	64 (47.1)	
Smoking index, median(IQR), pack-year	43.50(27.00, 63.00)	40.00(15.75, 50.75)	0.045
BMI, mean±SD, kg/m ²	22.53±3.62	22.68±4.20	0.721
<18.5, n(%)	32(14.7)	22(16.2)	0.630
18.5-24, n(%)	111(50.9)	62(45.6)	
≥24, n(%)	75(34.4)	52(38.2)	
Comorbidity, n(%)	68(31.2)	34(25.0)	0.229
Exacerbations in previous year, median(IQR)	0(0, 1)	1(0, 2)	<0.001
0, n(%)	146(67.0)	63(46.3)	<0.001
≥1, n(%)	72(33.0)	73(53.7)*	
FEV1/FVC%, mean±SD	47.17±12.72	45.09±12.08	0.137
FEV1 % predicted, mean±SD	54.35±19.77	50.89±20.02	0.111
COPD disease severity, n(%)			0.142
Stage I	23(0.6)	14(10.3)	
Stage II	101(46.3)	49(36.0)	
Stage III	73(33.5)	51(37.5)	
Stage IV	21(9.6)	22(16.2)	
GOLD 2019 group classification, n(%)			<0.001
Group A	82(37.6)	29(21.3)*	
Group B	76(34.9)	43(31.6)	
Group C	16(7.3)	10(7.4)	
Group D	44(20.2)	54(39.7)*	

	Satisfied, N=136	Unsatisfied, N=218	<i>P-value</i>
CAT score, median(IQR)	10(6, 15)	13(9, 18)	<0.001
<10, n(%)	98(45.0)	39(28.7)	0.002
≥10, n(%)	120(55.0)	97(71.3)*	
mMRC score, median(IQR)	2(1, 2)	2(1, 3)	0.084
<2, n(%)	75(34.4)	44(32.4)	0.729
≥2, n(%)	143(65.6)	92(67.7)	
CCQ score, mean±SD	1.95±0.76	2.24±0.78	<0.001
<1.5, n(%)	56 (25.7)	24(17.6)	0.090
≥1.5, n(%)	162 (74.3)	112 (82.4)	
BODE index, median(IQR)	3.00(1.00, 4.25)	3.00(2.00, 5.00)	0.006
1, n(%)	102 (46.8)	51 (37.5)	0.049
2, n(%)	62(28.4)	35 (25.7)	
3, n(%)	41(18.8)	32 (23.5)	
4, n(%)	13(6.0)	18 (13.2) *	

Notes: Data are presented as the mean (SD), median (IQR), or number (%). Satisfied means global satisfaction score ≥66.67, unsatisfied means global satisfaction score <66.67. Categorical variables were compared using the Chi-square test, if $P < 0.05$, continue to use the Bonferroni test for comparison. * $P < 0.05$

Abbreviations: BMI, body mass index; BODE, body mass index, airflow obstruction, dyspnea, exercise capacity; CAT, COPD assessment test; CCQ, Clinical COPD questionnaire; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in one second; FVC, forced vital capacity; FEV1% predicted, forced expiratory volume in one second as a percentage of the predicted value; GOLD, Global Initiative for Chronic Obstructive Lung Disease; IQR, interquartile ranges; mMRC, Modified Medical Research Council Dyspnea Scale; N, number; SD; standard deviation; TSQM v. II Treatment Satisfaction Questionnaire for Medication version II.

Table 4. Associations between clinical characteristics and TSQM v. II global satisfaction according to multiple linear regression analysis

Variable	Unstandardized Coefficients		Standardized Coefficients		<i>P-value</i>	B 95% CI	
	β	SE	β	t		Lower bound	Upper bound
Variable	85.868	10.560		8.132	0.000	65.098	106.637
Gender	0.796	2.250	0.020	0.354	0.724	-3.629	5.221
Age	0.051	0.082	0.034	0.626	0.532	-0.109	0.211
Education level	-0.092	0.201	-0.026	-	0.647	-0.488	0.304
BMI	-0.542	0.219	-0.161	-	0.014	-0.973	-0.111
				0.458			
				2.473			

Exacerbations in previous year	-0.179	0.310	-0.035	-	0.563	-0.788	0.429
				0.579			
FEV1%predicted	-0.135	0.060	-0.209	-	0.024	-0.253	-0.018
				2.262			
mMRC score	2.814	1.263	0.223	2.228	0.027	0.330	5.299
CCQ score	-2.487	1.284	-0.150	-	0.054	-5.012	0.039
				1.936			
CAT score	-0.342	0.160	-0.182	-	0.033	-0.656	-0.027
				2.136			
BODE index	-2.057	0.903	-0.363	-	0.023	-3.833	-0.280
				2.277			

Notes: age, education level, BMI, exacerbations in the previous year, FEV1% predicted, mMRC score, CCQ score, CAT score, and BODE index were included as the independent variables in the model.

Abbreviations: BMI, body mass index; BODE, body mass index, airflow obstruction, dyspnea, exercise capacity; CAT, COPD assessment test; CCQ, Clinical COPD questionnaire; FEV1% predicted, forced expiratory volume in one second as a percentage of the predicted value; mMRC, Modified Medical Research Council Dyspnea; SE, standard error. CI, confidence interval.

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