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Factors related to self-management behavior among persons with mild-to-moderate chronic obstructive pulmonary disease in Wenzhou, China

Original Article

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Abstract: **Objective:** To describe the self-management (SM) behavior among persons with mild-to-moderate chronic obstructive pulmonary disease (COPD), and it examines the correlation between COPD knowledge, self-efficacy, perceived social support, and SM behavior among persons with mild-to-moderate COPD in Wenzhou, China.

Methods: A simple random sampling technique was used to recruit 121 persons with mild-to-moderate COPD who visited the respiratory outpatient department of the First Affiliated Hospital of Wenzhou Medical University in Wenzhou, China. Research instruments include a demographic data questionnaire, COPD SM scale, COPD knowledge questionnaire, 6-item chronic disease self-efficacy scale, and perceived social support scale. Descriptive statistics and Pearson's Correlation were used for data analysis.

Results: The findings show that the mean score of COPD SM scale was 2.70 (SD = 0.45). The Pearson correlation analysis revealed that the COPD knowledge ($r = 0.47$, $P < 0.001$), self-efficacy ($r = 0.28$, $P = 0.001$), and perceived social support ($r = 0.48$, $P < 0.001$) were positively correlated to the COPD SM behavior among persons with mild-to-moderate COPD in Wenzhou, China.

Conclusions: The findings indicate that disease knowledge, self-efficacy, and perceived social support were related to SM behavior in persons with mild-to-moderate COPD, which provides a theoretical basis for developing SM interventions for persons with mild-to-moderate COPD and improving this population's SM behavior.

Keywords: *COPD knowledge • mild-to-moderate COPD • perceived social support • self-efficacy • self-management behavior*

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive disease that requires lifelong management.[1] It is a global health problem because of its high prevalence, mortality, and increased economic burden.[1] The China Pulmonary Health Study (CPHS) (2018) conducted a survey showing that more than 100 million

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people suffer from COPD.[2] The prevalence of COPD among people aged over 40 years is 13.7% in China,[2] while another survey revealed that the prevalence of COPD among people aged over 40 years is 14.5% in Wenzhou, China.[3]

Studies show that the distribution of disease severity is dominated by mild-to-moderate COPD.[4,5] In China, 95.1% of COPD cases belonged to mild-to-moderate COPD.[6] However, the prevalence of persons with mild-to-moderate COPD may be underestimated because these people usually have fewer symptoms and are less likely to use medical care.[4] The previous research provides evidence that the pathophysiological condition and socioeconomic burdens of persons with mild-to-moderate COPD are known to be similar to those of subjects with severe COPD and very severe COPD.[7,8] The study found that persons with mild-to-moderate COPD experience a more rapid decline in forced expiratory volume in 1 second (FEV1) than those with severe and very severe COPD.[9,10] This finding signifies the need for self-management (SM) behaviors that could play an important role in preventing and slowing disease progression.

COPD SM behavior refers to an individual behavior, including symptom management, daily life management, emotional management, and information management to relieve and control symptoms, prevent exacerbation, slow disease progression, and improve quality of life.[4,11] Growing evidence of SM behavior has demonstrated its efficacy in reducing exacerbations and hospitalization, improving clinical outcomes and slowing lung function decline in persons with mild-to-moderate COPD.[12,13] Mild-to-moderate COPD is more capable of completing SM behaviors than severe and very severe COPD.[13] However, patients with mild-to-moderate COPD do not visit outpatient frequently due to mild symptoms and relatively good lung function. It results in lack of disease management information, which leads to lack of SM behaviors in patients with mild-to-moderate COPD.[4]

According to the literature review, persons with mild-to-moderate COPD usually co-manage the illness at home with family. Family members are essential in managing COPD, including providing information about the disease and supporting lifestyle changes (exercise, smoking cessation, diet).[14] This information is consistent with the Individual and Family Self-management Theory (IFSMT), which holds that the family is an essential source of support for the individual.[15] This study is based on a revised IFSMT by Ryan and Sawin.[15] The IFSMT defines SM behavior as the outcome of actual participation in the SM process as affected by context (risk and protective factors).[15] The IFSMT consists of 3 parts: context, process, and outcome.[15] Knowledge, self-efficacy, and social support belong to the process in the IFSMT. The IFSMT proposes that improving knowledge can increase the understanding of SM behavior and increase self-efficacy. Self-efficacy and social support can encourage individuals and families to participate in SM behavior.[15] Previous studies have found a correlation between COPD knowledge, self-efficacy, social support, and COPD SM behavior.[16–18]

COPD knowledge refers to the patient's understanding of COPD symptoms, medication, and risk factors.[19] Persons with mild-or-moderate COPD acquire knowledge at different stages of the disease to carry out SM behavior to maintain the stability of the disease and control the symptoms.[20,21] The study of persons with mild-to-severe COPD in China by Yang et al.[16] found that COPD knowledge was related to SM behavior (r = 0.37, P < 0.01). Lee et al.[21] found that, due to their lack of knowledge of COPD, they limited exercise and activities to avoid dyspnea, even though the international guidelines regard physical activity as beneficial to COPD patient health outcomes.

Self-efficacy refers to a person's confidence in his or her ability to perform a behavior under normal and stressful circumstances.[15] The individual's confidence is critical to developing SM behavior, especially as COPD SM becomes more burdensome and complex. A cross-sectional survey of 200 COPD patients found a weak correlation between self-efficacy and SM behavior, 78% of whom were mild-to-moderate cases (r = 0.19, P = 0.01).[22] A study in China showed a moderate positive correlation between self-efficacy and SM behavior of persons with mild-to-severe COPD, 69% of whom were mild-to-moderate cases (r = 0.67, P < 0.001).[23]

Social support means individuals get instrumental, emotional, and informative help to promote health from family, friends, and others.[24] The IFSMT holds that patients with positive influence and support from society in daily life are more likely to engage in recommended health behaviors.[15] In a study of 282 moderate-to-very-severe cases of COPD in the United States, the researchers found that individuals with a high level of social support had higher rates of physical exercise adherence compared with individuals with little social support (P < 0.05).[18]

COPD is a progressive disease, and there are differences in symptoms, treatment, and SM behavior among patients at different stages of the disease. However, previous studies mainly focused on all stages of severity of COPD or just the severe stage, limiting the generalizability of the findings to persons with mild-to-moderate COPD. Moreover, cases of COPD performing effective SM behavior in the mild and moderate stages might slow disease progression, improve quality of life, and reduce medical costs. However, there is a dearth of studies on SM behavior and related factors of people with mild-to-moderate COPD in China, including Wenzhou.

Therefore, guided by the IFSMT framework, we explored the status of SM behavior in mild-to-moderate COPD and examined whether COPD knowledge, self-efficacy, and perceived social support are related to SM behavior among persons with mild-to-moderate COPD in Wenzhou, China.

2. Methods

2.1. Sampling and setting

The descriptive correlational research design was used to investigate the correlation among COPD knowledge, self-efficacy, perceived social support, and SM behavior among persons with mild-to-moderate COPD. This study was conducted at the respiratory outpatient department of the First Affiliated Hospital of Wenzhou Medical University in Wenzhou from August to September, 2021.

Simple random sampling was used in this study. The randomly selected sample was unbiased, and each sample unit had an equal chance to be selected. The researcher randomly selected 50% of these persons as the study population by preparing two sheets of paper of the same size with the words “odd” and “even” on each sheet. The pieces of paper were folded and mixed in a prepared bag. On the morning of every day, the researcher randomly selected one piece of paper from the bag. If the researcher picked a piece of paper with the word “even” on that day, then the researcher collected data from mild-to-moderate cases of COPD with an even number of appointments.

The sample size in this study was calculated by using the G*Power 3.1.9.7 program (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) for correlational research design. In the literature review, studies of the relationship between the SM behavior and each independent variable found effect sizes from correlation analysis ranging range from 0.15 to 0.31,17,and 25, which are small or medium effect sizes. In this study, the effect size of 0.25, alpha of 0.05, and power of 0.80 were used for computing the sample size. The required sample size was at least 120 participants. Therefore, the final sample had 121 participants in this study.

The inclusion criteria of this study were age ≥20 years, diagnosed with COPD for at least 6 months, the Spiro metric result for airflow limitation was a post-bronchodilator fixed ratio of $FEV_1/FVC < 0.70$ and FEV_1 ≥50%, having a certain ability to write and speak Chinese, and having good orientation to place and time. Exclusion criteria were having a history of mental illness or major physical disability such as blindness or reduced physical mobility which required assistance.

2.2. Measurements

2.2.1. The demographic questionnaire

The demographic questionnaire was developed by the researcher, specific for this study. Part 1 of the demographic questionnaire contains information about participant characteristics, which include gender, age, marital status, living conditions, residential area, educational attainment, income level, medical insurance, and occupation status. Part 2 of the questionnaire contains health information of participants which includes the degree of airflow limitation, smoking status, duration of COPD, history of exacerbation and COPD-related hospitalizations during the previous year, respiratory symptoms, comorbidities, daily COPD treatment, and source of COPD education.

2.2.2. COPD self-management scale

The COPD self-management scale (CSMS) was designed and developed by Zhang et al.[11] The scale includes 5 domains: Symptom management, daily life management, emotional management, information management, and self-efficacy. This study only focused on the SM behavior of cases of COPD. Yang et al.[16] modified the CSMS and retained only 4 domains, and self-efficacy was omitted. Moreover, the modified version of CSMS deleted these two items “*I do not take steroids* (e.g., prednisone or dexamethasone) *when I feel serious shortness of breath*” and “*I do not take anti-inflammatory drugs when I feel serious shortness of breath*.” The two items deviated from the actual treatment strategy for COPD patients used in the clinic because this could potentially negatively affect the reliability of the symptom management part of the questionnaire. Thus, the modified version of the CSMS was used to evaluate the level of SM behavior of persons with mild-to-moderate COPD in this study.

The scale consists of 40 items and 4 dimensions: Symptom management (6 items), daily life management (14 items), emotional management (12 items), and information management (8 items). These items were scored using the Likert 5-grade scoring method, and the response options were designated as “never, very few, sometimes, often, and always,” which were scored 1–5 points, respectively. The final dimension score is obtained by dividing the total scores of each dimension by the number of items. The final total score of the CSMS was the sum across 40 items, divided by 40, so that the score range is within 1–5 points. The higher the score, the better the SM behavior. The Cronbach’s α in this study was 0.89.

2.2.3. COPD knowledge questionnaire

COPD knowledge questionnaire (COPD-Q) was published by the Department of Clinical Pharmacy of Tennessee University in 2009.[19] The scale consists of 13 items, including prevention, clinical manifestation, treatment, and risk factors of COPD.[19] It includes 8 positive knowledge questions that are true and 5 reverse knowledge questions that are false.[19] There are 3 options for each topic, namely "*yes*", "*no*," and "*not sure*." The answer "*yes*" to the positive knowledge question was scored 1 point, while an answer of "*no*" or "*not sure*" was scored 0. The reverse knowledge question score was designed in a opposite way.[19] The total potential score ranges from 0 to 13, with a higher score indicating a higher level of COPD knowledge.[19] The Cronbach's α in this study was 0.80.

2.2.4. Self-efficacy for managing chronic disease 6-item scale

The Self-efficacy for managing chronic disease 6-item scale (SES6) was designed by Kate et al.[26] In this study, the SES6 was used to measure self-efficacy of mild-to-moderate cases of COPD. Fu introduced the SES6 in China and translated it into Chinese following the back-translation process.[27] The scale includes two parts: Symptom management self-efficacy and disease generality management self-efficacy, using a total of 6 items. The scale adopts the method of view simulation. The score for each item has a potential range from 1 to 10, with options ranging from "*Have no confidence at all*" to "*Absolutely confident*". The total potential score of the scale ranges from 6 to 60 points. The higher the score, the higher the level of self-efficacy. For Cronbach's α, the reliability of the instrument in this study was 0.88.

2.2.5. Perceived social support scale

The multidimensional scale of perceived social support was developed by Zimet et al.[24] In this research, the Chinese version Perceived social support scale (PSSS) was used to measure the level of perceived social support in persons with mild-to-moderate COPD. The scale was translated into Chinese following the back-translation processes by Jiang[28] The scale consists of 3 parts and 12 items, including family support, friends' support, and others' support. The potential score for each item ranges from 1 to 7, with response options from "very *strongly disagree*" to "*very strongly agree*," respectively. The final total score of the PSSS was summed across the 12 items, then divided by 12, so that the range of the potential score is from 1 to 7 points. In this approach, any mean scale score ranging from 1 to 2.9 could be considered low support; a score of 3 to 5 could be considered moderate support; and a score from 5.1 to 7 could be considered high support.[24] The Cronbach's α of this study was 0.89.

2.3. Data collection

Data collection was done using the Chinese pandemic prevention methods of the coronavirus disease of 2019 (COVID-19). Before data collection, the researcher informed the participants and their families about the aim, ethical issues, human protections, and procedure of the study. Signed consent was obtained after the participants understood and were willing to fill the questionnaire. The researcher checked the completeness of the questionnaires and ensured that participants could see their doctor in time after the questionnaire was completed.

2.4. Data analysis

Statistical analyses were conducted by using IBM SPSS 26.0 software (IBM Corporation, Armonk, NY, USA). The descriptive statistics include frequencies, percentages, means, and standard deviations (SDs) of the mild-to-moderate cases of demographic data and SM behavior. The normal distribution of the variables was tested for skewness/standard error and by the Kolmogorov–Smirnov test. The Pearson's product moment correlation was used to examine the relationship between COPD knowledge, self-efficacy, social support, and SM behavior with mild-to-moderate COPD. All *P* values were two sided, and values of $P < 0.05$ were considered to be statistically significant.

3. Results

A total of 121 persons with mild-to-moderate COPD participated in the study. Of that, 78.5% were male. The mean age of participants was 68.7 (SD = 9.6) years. Most participants were married (89.3%) and 91.7% lived with their families. Three out of 5 participants (61.2%) lived in a suburban community. Among these participants, 94.2% had junior high school or lower education (Table 1).

Table 2 shows the mean FEV_1, which was predicted to be 71.3% (SD = 12.9). In the past 12 months, 56.2% of participants had experienced exacerbation at least once. Most (79.3%) participants had at least one respiratory symptom. About half of the participants (48.8%) had at least one co-morbidity. Two out of five (40.5%) participants did not have daily COPD treatment. All participants (100.0%) reported not participating in the pulmonary rehabilitation (PR) program. Over

Demographic characteristics	N (%)
Age (years)	
45–59	25 (20.7)
60–74	59 (48.8)
75–89	37 (30.5)
Gender	
Male	95 (78.5)
Female	26 (21.5)
Marital status	
Single	1 (0.8)
Married	108 (89.3)
Divorced	2 (1.7)
Widowed	10 (8.2)
Living condition	
Alone	10 (8.3)
Family (spouse and/or children)	111 (91.7)
Residential area	
Urban	47 (38.8)
Suburban	74 (61.2)
Education level	
Primary or lower	74 (61.1)
Junior high school	40 (33.1)
Senior high school	5 (4.1)
College or above	2 (1.7)
Household income (Yuan per month)	
≤2000 (310.2 US$)	27 (22.3)
2001–5000 (310.3–775.4 US$)	64 (52.9)
5001–8000 (775.6–1240.7 US$)	25 (20.7)
≥8001 (1240.9 US$)	5 (4.1)
Occupation status	
Unemployed	40 (33.1)
Employed	55 (45.4)
Farmer	33 (27.3)
Professional jobs (doctor/teacher)	7 (5.8)
Factory workers/laborer	15 (12.3)
Retired	26 (21.5)

Note: SD, standard division.

Health information	N (%)
Duration of COPD (years)	
<1	6 (5.0)
1–5	65 (53.7)
6–10	41 (33.9)
>10	9 (7.4)
Smoking status	
Never	33 (27.3)
Current smoking	43 (35.5)
Quit smoking	45 (37.2)
FEV_1 (%)	
50–79 (moderate)	89 (73.6)
≥80 (mild)	32 (26.4)
Exacerbation history (within 12 months)	
None	53 (43.8)
1–3	47 (38.8)
3	21 (17.4)
COPD-related hospitalizations (within 12 months)	
None	78 (64.5)
1–3	32 (26.4)
>3	11 (9.1)
Respiratory symptoms	
None	25 (20.7)
Yes*	96 (79.3)
Dyspnea	21 (17.4)
Wheezing	58 (47.9)
Cough	82 (67.8)
Expectoration	65 (53.7)
Co-morbidities	
None	62 (51.2)
Yes*	59 (48.8)
Hypertension	38 (31.4)
Diabetic	13 (10.7)
Heart disease	16 (13.2)
Others**	19 (15.7)
Daily COPD treatment	
No	49 (40.5)
Yes*	72 (59.5)
Drug	71 (58.7)
Oxygen	21 (17.4)
Traditional Chinese medicine	8 (6.6)
PR program	
No	121 (100)
Yes	0 (0)
Source of COPD information	
No	27 (22.3)
Yes*	94 (77.7)
Physician	94 (77.7)
Nurse	53 (56.2)

Continued

Table 1. Frequency, percentage, mean, and SD of demographic characteristics of the participants (n = 121).

three-fourths (77.7%) of participants received COPD information. About one in 5 participants (22.3%) did not get any COPD information.

The mean score of overall COPD SM behavior was 2.7 (SD = 0.44). For all participants, the highest scores were in the domain of daily life management behaviors, 3.4 out of 5 (SD = 0.51), while the lowest scores were in information management behaviors, 2.0 (SD = 0.55), as shown in Table 3.

Table 2. Continued

Health information	N (%)
Internet	10 (8.3)
WeChat	16 (13.2)
Others (family, other cases of COPD)	15 (12.4)

Note: COPD, Chronic obstructive pulmonary disease; FEV_1, forced expiratory volume in 1 s; PR, pulmonary rehabilitation; SD, standard division.
*Can answer more than 1 items.
**Osteoporosis, hyperlipidemia, prostate cancer, benign prostatic hyperplasia, rectal cancer, and lumbar disc herniation.

Table 2. Frequency, percentage, mean, and SD of health information of the participants (n = 121).

COPD SM behavior	Range		M	SD
	Possible score	Actual score		
COPD SM behavior	1–5	1.4–3.9	2.7	0.44
Symptom management	1–5	1–4.8	2.5	0.76
Daily life management	1–5	1.4–4.4	3.4	0.51
Emotional management	1–5	1.3–4.3	2.6	0.54
Information management	1–5	1–3.6	2.0	0.55

Note: COPD, Chronic obstructive pulmonary disease; SD, standard division; SM, self-management.

Table 3. Range, mean, and SD of SM behavior among the participants (n = 121).

Independent variables	Range		M	SD	Level
	Possible score	Actual score			
COPD knowledge	0–13	0–12	5.4	3.30	-
Self-efficacy	1–10	1.83–9.67	6.3	1.75	-
Perceived social support	1–7	1.33–6.83	4.3	1.06	Moderate
Family support	1–7	1.75–7.00	5.5	0.88	High
Friend support	1–7	1.00–6.75	3.5	1.47	Moderate
Other support	1–7	1.00–7.00	3.8	1.39	Moderate

Note: COPD, Chronic obstructive pulmonary disease; SD, standard division.

Table 4. Range, mean, and SD of COPD knowledge, self-efficacy, and perceived social support among the participants (n = 121).

Items	COPD SM behavior	*P*-value
COPD knowledge	0.50	<0.001
Self-efficacy	0.29	0.001
Perceived social support	0.49	<0.001

Note: COPD, Chronic obstructive pulmonary disease; SM, self-management.

Table 5. Association between COPD knowledge, self-efficacy, perceived social support, and COPD SM behavior (n = 121).

Table 4 shows that the COPD knowledge score ranged from 0 to 12, with a mean of 5.4 (SD = 3.30). The self-efficacy score ranged from 1.8 to 9.7, with a mean score of 6.3 (SD = 1.75). The total perceived social support score ranged from 1.3 to 6.8, with a mean score of 4.3 (SD = 1.06). There was a significant positive correlation between COPD knowledge (r = 0.50, P < 0.001), self-efficacy (r = 0.29, P = 0.001), perceived social support (r = 0.49, P < 0.001), and COPD SM behavior. The results are displayed in Table 5.

4. Discussion

The objective of this study was to address important gaps in the literature by investigating the level of SM behavior and their relationship with COPD knowledge, self-efficacy, and perceived social support among mild-to-moderate cases of COPD from Wenzhou, China.

4.1. COPD SM behavior among persons with mild-to-moderate COPD

This research found that the score of COPD SM behavior among persons with mild-to-moderate COPD was 2.7 out of 5 (SD = 0.44). This indicates a low COPD SM score. Compared with other studies about SM behavior in Chinese cases of COPD, this research result was a little lower (3.1, 2.8, 3.2).[29–31] The analysis of the subscale of CSMS found that the highest score was for daily life management. This finding implies that the participants of this study, although they had mild or moderate COPD, could still maintain and manage daily life. The mean score for emotional, symptom, and information management was lower than that in other studies in China.[25,29] Persons with mild-to-moderate COPD in Wenzhou had a low level of SM behavior.

The relatively low-level SM behavior among persons with mild-to-moderate COPD in this study can be explained through the IFMST, which shows that aspects

of a case's condition, such as complex symptoms and treatment, physical and social environmental factors (e.g., residential area, work status), and individual and family factors (e.g., education, gender), are related to SM behavior, which impacted COPD SM behavior.[15]

Previous studies have shown that the severity of the disease is related to people's SM behavior.[32] Severe COPD patients experience repeated deterioration of their health. They are more willing to control their symptoms by ameliorating SM behavior.[25,29] However, because of mild symptoms and relatively good lung function, few cases of mild-to-moderate COPD choose effective SM behavior (e.g., breathing training) to improve symptoms.[13] The results of this research indicate that 61.2% of participants reported never performing breathing training.

Comorbidity may be an essential factor leading to a low level of SM behavior. In this study, 48.8% of the participants had comorbidity and 15.7% had more than one comorbidity. Patients with multiple chronic diseases are required to engage in various complex therapeutic and SM activities, which can increase the patient's treatment burden, thereby affecting SM adherence and subsequent outcomes.[33,34] In addition, patients often prefer to manage the symptomatic disease.[35] People with mild or moderate COPD usually have milder symptoms, which leads to non-prioritization of COPD.[35] This study also found that 40.5% of participants reported not having daily COPD treatment.

This study found that participants obtained less information on COPD and only from a single source (i.e., mainly healthcare providers). This may be because healthcare providers also focus health education efforts on severe and very severe COPD.[35] Patients with mild or moderate COPD usually get information later in the course of illness and only when they experience an exacerbation.[36] This late COPD education may also be associated with poor SM behavior in patients with mild-to-moderate COPD.[36]

In this study, it was found that 61.2% of participants lived in a rural area. The research found that COPD cases living in urban areas had better SM behavior (e.g., quitting smoking, performing regular exercise, eating healthy diets) than people in rural areas in China.[37] This may be due to the fact that rural areas in China are expansive, and public transportation is inconvenient, thus reducing the opportunity for individuals to obtain hospital services, which is essential for COPD SM behavior.[38,39]

Furthermore, this study found that almost all participants had attained only junior high school or lower education (94.2%). Low levels of education can impede patient understanding and application of COPD information.[11,35] In addition, gender impacts the health behavior of the COPD population.[39] In Chinese culture, women always play the role of caregiver in the family and are more diligent in managing their health, household, and members' health.[11] Moreover, females are more willing to perform SM behavior than males. In this study, 78.5% of the participants were men, while only 21.5% were women, and that could reflect gender differentials in COPD prevalence in the population.

These findings suggest that SM behavior among persons with mild-to-moderate COPD was limited. Healthcare providers should consider developing feasible strategies to improve the SM behavior of people with mild-to-moderate COPD.

4.2. Factors related to SM behavior

This research found that COPD knowledge and SM behavior were associated in cases of mild-to-moderate COPD, which is consistent with this study's hypothesis. This result is consistent with many other studies which found that COPD knowledge was positively associated with COPD SM behavior in different settings and across disease stages.[16,40] The IFSMT implies that enhancement of knowledge and specific health beliefs are linked to engagement in self-regulation behaviors, resulting in more SM behavior.[15] The previous studies found that cases that lack adequate COPD knowledge might have adverse consequences, including a lack of awareness of the effectiveness of SM strategies, the importance of COPD treatment and SM, and the long-term effects.[16,21]

The participants in this study had a low level of COPD knowledge. The mean score of COPD knowledge was 5.4 out of 12 (SD = 3.3). This finding is consistent with other studies from China which found that cases of COPD lacked adequate COPD knowledge.[21,16] A study from Korea reported that mild-to-moderate cases of COPD had lower COPD knowledge than cases of severe COPD.[21] This may be due to the fact that mild-to-moderate COPD sufferers had fewer barriers to daily activities and, thus, were less concerned about accessing health care resources and consulting with healthcare providers.[8] Moreover, the relatively low level of education of the participants in this study perhaps impeded their ability to learn and understand COPD health education. Thus, in this study, a low level of COPD knowledge may explain deficient COPD SM behavior.

In the present study, a higher self-efficacy score was associated with better SM behavior among the participants. According to the IFSMT, self-efficacy refers to a person's confidence in successfully performing a behavior under normal and stressful circumstances.[13,15] The previous studies reported that higher self-efficacy increases the confidence and ability to control disease daily. In the case of COPD, higher self-efficacy would be

reflected in functional exercise, smoking cessation, and medication adherence, i.e., more persistent and effective SM.[17,41] Self-efficacy will have an even more substantial impact on SM behavior in mild-to-moderate COPD who may feel more self-reliant and independent.[13,42] Thus, increasing self-efficacy in mild-to-moderate COPD seems fundamental for SM behavior support.

This study found that the participants had a low level of self-efficacy. The IFSMT predicts that individuals and families develop self-efficacy when acquiring appropriate knowledge and beliefs, improving SM outcomes.[15] The previous research provides evidence that a lack of skills and knowledge to cope with COPD will reduce a patient's self-efficacy.[17] Low self-efficacy is related to poor exercise and low level of cognitive symptom management behaviors, which are not conducive to healthy behaviors.[29] Accordingly, primary health care could prioritize implementing non-pharmacological interventions, such as educating persons to recognize the symptoms and avoiding exacerbation, as that education could enhance self-efficacy in cases of COPD.[42,43]

This study found that perceived social support and SM behavior have a moderate positive correlation ($r = 0.50$, $P < 0.001$), implying that COPD patients with a higher level of social support would be more likely to perform more SM behavior. Previous research supports the results of this study, namely that higher social support is associated with more significant physical exercise, vaccination, and higher levels of PR.[44] The IFSMT predicts that social support improves knowledge, self-regulation skills, and self-efficacy, thereby increasing SM behavior.[15,18] People with higher levels of social support are more likely to gain active health-promoting behaviors and strengthened coping strategies under stressful situations, thereby enhancing SM capabilities.[18,44]

This study found that the perceived social support score was 4.3 out of 7 ($SD = 1.06$), which means that participants had limited perceived social support. Previous studies had found that social support positively correlates with disease severity in cases of COPD.[29,44] This study focused on mild or moderate COPD cases, and the lack of severe symptoms may result in less concern by families and healthcare providers. Mild-to-moderate COPD persons receive less attention and are provided with fewer resources than cases of severe and very severe COPD.[13,45,46] In addition, in China's health policy, community hospitals do not include COPD in the daily follow-up of chronic diseases.[29,47] This means that COPD persons, especially mild-to-moderate COPD cases, receive less support from staff in the community and other health delivery centers in their daily lives, including receiving COPD information and education and follow-up treatment options. This neglect, in turn, reduces perceived social support for mild-to-moderate COPD sufferers.[40] Lack of social support has been identified as a hindrance to effective COPD SM behavior, resulting in reduced motivation to adopt SM behavior.[18,44] Healthcare providers should implement strategies to improve social support for mild-to-moderate COPD sufferers.

4.3. Implications for nursing management practice

This study found that the SM behavior of people with mild-to-moderate COPD in Wenzhou was not ideal. In particular, regarding information management, we recommend that healthcare providers should give more education to persons with mild-to-moderate COPD about causes, treatment, and rehabilitation care plans. Programs should encourage communities to establish COPD rehabilitation clubs to regularly educate and guide persons and their families about COPD rehabilitation to raise awareness and attention about COPD. In addition, healthcare providers should also pay greater attention to cases with mild-to-moderate COPD and develop personalized SM plans for these cases and their families.

This study provides valuable information about SM behavior and related factors of persons with mild-to-moderate COPD in Wenzhou, China. This information provides a basis for designing interventions to change SM behavior by targeting COPD knowledge, self-efficacy, and social support.

4.3.1. Limitations of this study

This study enrolled participants from only one hospital in Wenzhou, whose results may not represent the characteristics of the mild-to-moderate COPD population in the entire Wenzhou, China. We recommend replicating this study in multiple settings to generalize the results about the mild-to-moderate COPD population in Wenzhou.

4.3.2. Recommendations for future research

The results suggest that further research is needed to examine the influence of COPD knowledge, self-efficacy, and perceived social support as they influence COPD SM behavior in mild-to-moderate cases. Further studies are needed to strengthen this relationship and determine the exact methods that can effectively improve COPD knowledge, self-efficacy, perceived social support, and SM behavior.

This research has opened the door for researchers interested in analyzing SM behavior of persons with mild-to-moderate COPD. Researchers can incorporate the results of this study to explore other factors

associated with SM behavior in mild-to-moderate COPD populations to better promote SM generally.

5. Conclusions

Supporting SM in persons with mild or early COPD remains challenging. Healthcare providers generally focus on SM behavior support and rehabilitation for patients with more severe disease or symptoms. However, if we can promote the engagement of patients with mild-to-moderate COPD in effective SM behavior and delay the decline in FEV_1, there will be potential for considerable health and health service gains. This study found that COPD knowledge, self-efficacy, and perceived social support were positively associated with SM behavior among persons with mild-to-moderate COPD. The results confirm the importance of considering a patient's level of COPD knowledge, self-efficacy, and perceived social support when designing SM programs for people living with mild-to-moderate COPD.

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Ethical considerations

The permission to conduct the study was granted by the Institutional Review Board of Burapha University, Thailand, (Protocol code G-HS 041/2564) and the Research Ethic Board of the First Affiliated Hospital of Wenzhou Medical University, in Wenzhou, China (Protocol code 2021- 095). Recruitment of participants was carried out purely based on volunteerism. Only those participants who were willing and consented to take part in the study were recruited. All data obtained from the study were kept strictly confidential.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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