Research Article

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Factors Associated with Fall-Efficacy in Older Adults with Chronic Obstructive Pulmonary Disease

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a leading cause of global morbidity and mortality. It further leads to impair balance, due to systemic inflammation and muscle strength decreasing. Meta-analytic evidence indicates that approximately 30% of individuals with stable COPD experience falls, **Objective:** This descriptive correlational study examined fall-efficacy and its associated factors in older adults with chronic obstructive pulmonary disease (COPD). **Methods:** The 126 participants who met the eligibility criteria were recruited using a simple random sampling technique from the respiratory medicine outpatient clinic of a university hospital in China between December 2024 and January 2025. Data were collected using validated Chinese-language instruments, including the Modified Falls Efficacy Scale, the Geriatric Depression Scale-15, the Activities of Daily Living scale, the Self-Rated General Health measure, the COPD Assessment test, and the Timed Up and Go test. Data were analyzed using descriptive statistics and Spearman's rho correlation. **Results:** The mean age of the participants was 70.19 years (SD=6.09). Fall-efficacy was high (mean = 8.59, SD = 1.52). Fall-efficacy was strongly negatively correlated with depression, poorer balance ability, and COPD-related health impact (ρ=-0.641, ρ=-0.543, and ρ=-0.508, respectively; all $p < .001$). It was moderately negatively correlated with perceived health status and number of medications used ($\rho = -0.444$ and $\rho = -0.326$, respectively; both $p < .001$). Age showed a weak negative correlation ($\rho = -0.259$, $p = .003$), whereas ADL showed a weak positive correlation

with fall-efficacy (ρ = 0.182, p = .041). No significant association was found between fall history and fall-efficacy (ρ = -0.147, p = .099). **Conclusion:** In conclusion, fall-efficacy in older adults with COPD is associated with multidimensional factors across ICF domains. These factors should be incorporated into routine assessment and daily management to facilitate early identification and monitoring.

Keywords: Chronic obstructive pulmonary disease, Older adults, Fall-efficacy, Depression, Balance

What was Known

- Older adults with chronic obstructive pulmonary disease had lower fall-efficacy when compared to healthy older people.
- Decreasing fall-efficacy is often lead to functional independence decline and higher mortality.
- Several factors may affect older adults with chronic obstructive pulmonary disease

What's New and Next

- Older adults with chronic obstructive pulmonary disease demonstrated high fall-efficacy.
- Depression, balance ability, and COPD-related health impact were strongly negatively associated with fall-efficacy.
- Future research on predictive factors of fall-efficacy in older adults with COPD is recommended.

Introduction

Chronic obstructive pulmonary disease (COPD) is a leading cause of global morbidity and mortality, ranking as the seventh leading cause of illness and the third major cause of death[1]. In 2019, 212.3 million individuals were living with COPD worldwide, with China alone accounting for over 45 million cases and more than one million deaths[2,3].

COPD incidence tends to increase with age, and ageing hallmarks are strongly correlated with COPD. Ageing of the lung involves cellular senescence, mitochondrial dysfunction, stem cell exhaustion, and extracellular matrix (ECM) alterations, leading to impaired tissue structure and function. These changes are accompanied by chronic inflammation and altered intercellular communications, resulting in impaired tissue repair and dysregulated immunological response. Together, these processes contribute to progressive decline in lung function and increased

vulnerability to respiratory disease and disability[4]. COPD further leads to impair balance, mainly due to systemic inflammation, decreased muscle strength, and age-related decline in neuromuscular function and proprioception[5]. Meta-analytic evidence indicates that approximately 30% of individuals with stable COPD experience falls, and the incidence of falls is about four times higher than their healthy peers[6,7]. In China, falls among older adults have risen nearly 80% in the past three decades, with Zhejiang Province reporting the highest incidence nationally[8]. Studies in China indicate that factors such as increasing age, history of falls, medication use, poor activities of daily living, poor self-rated health, and chronic diseases increase the risk of falls among older adults[9,10].

Due to the high prevalence of falls in COPD patients, this can lead to a lower quality of life, higher mortality, and a decline in functional independence[11,12]. Additionally, falls can also have psychological effects, leading to low fall-efficacy[13]. Falls in older adults with COPD are closely associated with low fall-efficacy, defined as diminished confidence in performing daily activities without falling[14]. The low fall-efficacy primarily leads to limited mobility in older adults, which in turn contributes to a vicious cycle of inactivity, poorer physical fitness, decreased confidence, and an increased risk of falls[13]. This cycle accelerates disease progression, reduces independence, and increases hospitalization rates. Furthermore, activity avoidance and social withdrawal amplify risks of depression and caregiver burden, ultimately undermining quality of life and increasing healthcare costs[15-17]. Given the particularly high burden of COPD and falls in Zhejiang, China, understanding the factors associated with fall-efficacy in this population is crucial for informing targeted interventions and nursing practices aimed at promoting independence, preventing falls, and improving overall health outcomes.

Based on an extensive review of the literature, balance ability, COPD-related health impact, ADL, age, fall history, depression, perceived health status and number of medications used may be associated with fall-efficacy in older adults with COPD. The International Classification of Functioning, Disability, and Health (ICF), a framework developed by the World Health Organization (WHO), was applied to classify these factors. The ICF framework classify disease as a “components of health” which defines health and some health-related components of well-being. Importantly, ICF identifies the constituents of health with regard to etiology so that researchers can draw causal inferences using appropriate scientific methods[18]. The ICF structures information in two parts: Part 1, covering Functioning and Disability (Body Functions and Structures, and Activities and Participation), and Part 2, covering Contextual Factors (Environmental Factors and Personal Factors). Prior evidence

demonstrated the applicability of ICF as a framework model for fear of falling[19]. Guided by this framework, the present study organized the variables into four domains.

The “Body Functions and Structures” category includes the two factors of balance ability and COPD-related health impact. A decline in balance ability can lead to limited mobility, impaired physical and mental functioning, and a gradually increased risk of falls, which may be associated with a decline in older adults’ fall-efficacy[20,21]. Older adults with very high COPD-related health impact have 10 times the risk of developing frailty than those with normal lung function. As the severity of the airflow restriction increases, they become more frail[22]. This will increase the risk of falling and is associated with low fall-efficacy. The "Activities and Participation" category includes the factor of activities of daily living (ADL). The decline in the ADL of patients with COPD is mainly caused by the symptoms of dyspnea[23]. Therefore, they need more help in ADL, which will make them more insecure about their physical abilities and then fall-efficacy becomes lower[21]. The “Personal Factors” category includes four factors: age, history of falls, depression, and perceived health status. Through a review of the previous relevant literature, it has been found that these four factors are related to the fall-efficacy in older adults[24,25]. The last category, “Environmental Factors”, includes the factor number of medications used[19]. Studies have shown that an increase in the number of medications used can greatly increase the risk of falls in people with COPD[6]. Moreover, it may be associated with low fall-efficacy.

Taken together, these domains reflect the multifactorial determinants of fall-efficacy in older adults with COPD. The conceptual relationships among these factors are shown in Figure 1.

At present, there have studies on factors associated with fall-efficacy in older adults, but there are still few for older adults with COPD, especially in China. Therefore, the aim of the study was to examine the level of fall-efficacy and the relationship between the variables consist of age, COPD-related health impact, fall history, depression, balance ability, perceived health status, number of medications used, ADL and fall-efficacy in older adults with COPD.

Materials and Methods

Participants

This study employed a descriptive correlational design to examine fall-efficacy and its associated factors among older adults with COPD. The participants comprised older adults aged ≥60 years, both male and female, who had been clinically diagnosed with COPD by a physician

and attended the respiratory medicine outpatient clinic of the First Affiliated Hospital of Wenzhou Medical University, in China between December 2024 and January 2025.

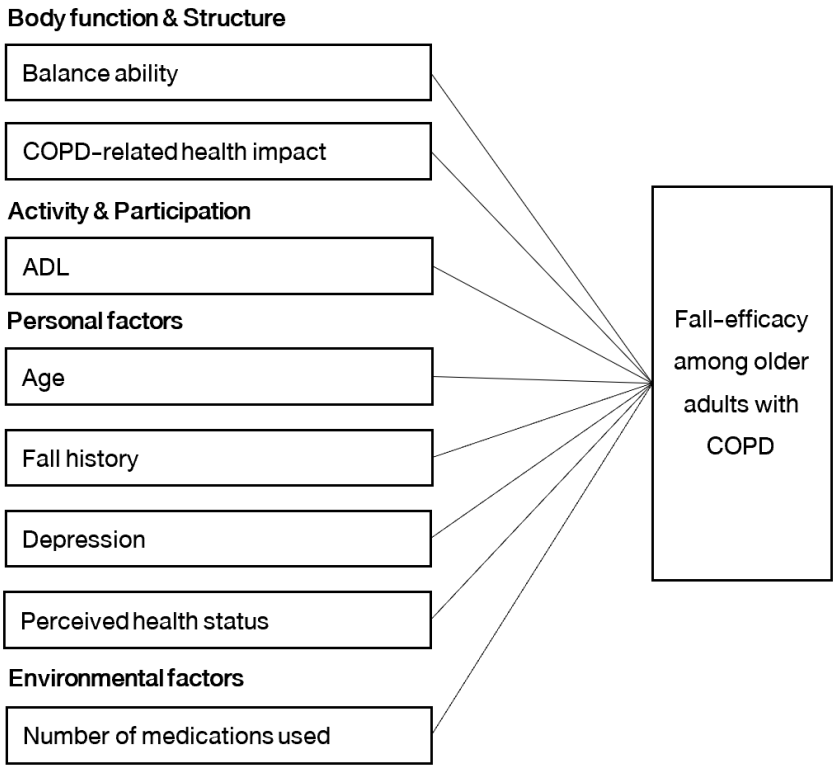


Figure 1 The conceptual relationships among factors.

Eligible participants were aged ≥60 years, had a confirmed diagnosis of COPD, and met the following criteria: (1) No cognitive impairment, defined as a score ≥4 on the Chinese version of the Mini-Cog; (2) Adequate proficiency in spoken and written Chinese; (3) Ability to ambulate independently, with or without the use of a cane or walker; (4) Low to high COPD-related health impact, as assessed by the COPD Assessment Test (CAT), with scores ranging from 0 to 30[26]; and (5) Voluntary consent to participate in the study. Participants with CAT scores of 31–40, indicated a very high impact of COPD characterized by severe limitations in daily activities[26], were not included.

Exclusion criteria were: (1) presence of an acute, severe, or clinically unstable conditions during the study period; and (2) inability to complete study for any reason.

Sample Size and Sampling Procedure

Sample size was calculated a priori using power analysis in G*Power 3.1.9.7[27] for a bivariate normal correlation (two-tailed; α = .05; power = 0.90). A medium effect size (r = .30) was assumed,

in accordance with Cohen[28]. This yielded a required sample size of 112 participants. To account for nonresponse or incomplete data, the sample size was increased by 12.5%, consistent with the average attrition rate reported in clinical health research[29], resulting in a final target sample size of 126 participants. Participants were recruited using a simple random sampling technique until the required sample size of 126 participants was achieved.

Research Instruments

Screening Instrument

Dementia was screened by the Mini-Cog[30], Chinese version[31]. The test comprises a three-item recall and a clock drawing task and can be completed in approximately 3 minutes. A score ≥4 was considered indicative of normal cognitive function[30]. This screening test was validated among Chinese neurology outpatients and demonstrated higher sensitivity than the Mini-Mental State Examination (MMSE) [31].

Data Collection Instruments

(1) The Basic Information Questionnaire was used to collect demographic and clinical variables, including age, gender, education, fall history, and number of medications used.

(2) Fall-efficacy was assessed using the Modified Falls Efficacy Scale (MFES)[32], Chinese version[33]. The scale contains 14 items (nine indoor and five outdoor activities), scored from 0 (no confidence) to 10 (complete confidence). The mean score represents the final score, with values >8 indicating high fall-efficacy and ≤8 indicating low fall-efficacy[32,33]. The MFES demonstrated excellent reliability and strong discriminant validity in older adults[33].

(3) Depression was assessed using the Geriatric Depression Scale-15 (GDS-15)[34], Chinese version[35]. The scale comprises 15 dichotomous items (yes/no), with five reverse-scored items. A total score ranging from 0 to 15 is calculated, with higher scores indicating greater depressive symptoms. Based on the established Chinese version, scores <8 indicate no depressive symptoms, whereas scores ≥8 indicate clinically relevant depressive symptoms[34,35]. The GDS-15 has demonstrated good internal consistency in older adults[35].

(4) ADL was assessed using the Barthel Index[36], Chinese version[37]. The scale consists of 10 items (eg, feeding, bathing, mobility, toileting), scored on a 0–100 scale, with higher scores indicating greater independence[36]. The Barthel Index has demonstrated high internal consistency, test–retest reliability, and predictive validity in older adults[37].

(5) Perceived health status was assessed using the Self-Rated General Health (SRGH)[38], Chinese version, with scores ranging from 1 (very good) to 4 (poor). The SRGH has demonstrated strong reliability and stability in a large sample, with robust correlations to other health indicators[39].

(6) Balance ability was assessed using the Timed Up and Go (TUG) test[40], Chinese version[41]. This test measures the time required for a participant to rise from a chair, walk 3 meters, turn, return, and sit down. Timing begins at command "start" and ends when the participant is seated with their back against the chair, and their arms resting on the armrests[40,41]. A time <12 seconds indicated normal balance, whereas ≥12 seconds indicates impaired balance[42]. The TUG demonstrated excellent intra- and inter-rater reliability and strong concurrent validity with the Berg Balance Scale and functional independence measures[43].

(7) The COPD-related health impact was assessed using the CAT[44], Chinese version[45]. The CAT consists of eight items, each scored from 0 to 5, with total scores ranging from 0 to 40. Higher scores indicate greater disease impact[44]. COPD-related health impact was categorized as low (<10), medium (10-20), high (21–30), and very high (31–40)[26]. The CAT has demonstrated good reliability[45].

Validity and Reliability of Instruments

Previous studies have demonstrated acceptable validity and reliability of the Chinese versions of the instruments. Reliability was confirmed in a pilot sample of 30 older adults with COPD at the study site: (1) Mini-Cog: Inter-rater reliability yielded a Kappa coefficient of 0.845. (2) MFES and CAT: Cronbach's α coefficients were 0.973 and 0.840, respectively. (3) GDS-15: Kuder Richardson 20 (KR-20) coefficient = 0.819. (4) Barthel Index, SRGH, and TUG: Test–retest reliability showed Pearson's r = 0.963 (BI), Spearman's ρ = 0.865 (SRGH), and Pearson's r = 0.975 (TUG) respectively.

Data Collection Procedures

Following ethical approval, data were collected at the outpatient clinic, which operates Monday through Saturday (8:00–12:00 a.m. and 1:30–4:30 p.m.). Cognitive function was assessed using the Mini-Cog to confirm eligibility. Those meeting the criteria proceeded to the data collection phase. Participants first completed the following instruments: Basic Information Questionnaire, CAT, SRGH, Barthel Index, GDS-15, MFES, and TUG. The questionnaires were administered face-to-face by the researcher. During the Timed Up and Go (TUG) test, the researcher timed each participant, while a trained research assistant provided safety support throughout the test to prevent loss of

balance and falls. Both the researcher and research assistant received training and supervision from an experienced researcher.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 27. Statistical significance was set at $\alpha = 0.05$, and all analyses were two-tailed. Descriptive statistics, including ranges, frequencies, percentages, means, and standard deviations (SDs), were used to summarize participant characteristics and study variables. Prior to correlation analysis, normality and linearity assumptions were assessed. The Kolmogorov–Smirnov test showed that only age and COPD-related health impact were normally distributed, and scatterplot inspection indicated no clear linear relationships; therefore, Spearman's rho correlation was used to examine associations between fall-efficacy and independent variables. Correlation coefficients were interpreted as strong ($\rho > 0.50$), moderate ($0.30 \leq \rho \leq 0.50$), or weak ($0 < \rho < 0.30$)[46].

Results

Ultimately, 126 participants met the inclusion and exclusion criteria and were included in this study. The average age of the participants was 70.19 years (SD = 6.09). Males constituted a higher

Table 1 Demographic and Clinical Characteristics of Older Adults with COPD (n=126)

Variables	n (%)
Age (years old)	
60-69	58 (46.0)
70-79	60 (47.6)
≥80	8 (6.4)
Mean ± SD	70.19 ± 6.09
Gender	
Male	107 (84.9)
Female	19 (15.1)
Educational level	
No formal education	18 (14.3)
Primary school	76 (60.3)
Junior high school and higher	32 (25.4)

Table 1 Demographic and Clinical Characteristics of Older Adults with COPD (n=126) (Cont.)

Variable	n (%)
Balance ability	
Normal balance	65 (51.6)
Balance impairment	61 (48.4)
COPD-related health impact	
Low impact	34 (27.0)
Medium impact	71 (56.3)
High impact	21 (16.7)
Fall history	
0	103 (81.7)
1	18 (14.3)
≥2	5 (4.0)
Depression	
Normal	120 (95.2)
Depression	6 (4.8)
Perceived health status	
Very good	8 (6.4)
Good	28 (22.2)
Fair	81 (64.3)
Poor	9 (7.1)
Number of medications used	
1	14 (11.1)
2	27 (21.4)
3	27 (21.4)
≥4	58 (46.1)
Fall-efficacy	
High fall-efficacy	84 (66.7)
low fall-efficacy	42 (33.3)

COPD, chronic obstructive pulmonary disease; SD, standard deviation.

proportion (84.9%). The education level was mainly primary school (60.3%). Regarding balance ability, 51.6% of the participants demonstrated normal balance ability. Additionally, regarding the COPD-related health impact, the medium impact had the highest proportion (56.3%) in the participants. Furthermore, the majority of the participants had no experience of a fall in the past year (81.7%). The study results indicate that most participants were not depressed (95.2%). Moreover, the proportion of perceived health status as fair was the highest in the participants (64.3%). The highest proportion used four or more medications (46.1%), while 21.4% used 2 and 3 kinds of medications. Most of the participants showed high fall-efficacy (66.7%) (Table 1).

The participants had a mean score of fall-efficacy of 8.59 (SD = 1.52), indicating a high level of fall-efficacy. Furthermore, the mean values of the study variables indicated that participants had impaired balance (mean = 12.04, SD = 2.26), a medium level of COPD-related health impact (mean = 13.65, SD = 6.73), and a high degree of independence in ADL (mean = 99.64, SD = 1.44). Additionally, participants reported nearly no fall history (mean = 0.25, SD = 0.64) and showed no depressive symptoms (mean = 3.27, SD = 2.35). Their perceived health status was close to fair (mean = 2.72, SD = 0.69), and the average number of medications used was 3.62 (SD = 1.87). The details are shown in Table 2.

Table 2 Mean and Standard Deviation of Study Variables (n=126)

Variables	Mean (SD)
Fall-efficacy	8.59 (1.52)
Balance ability	12.04 (2.26)
COPD-related health impact	13.65 (6.73)
ADL	99.64 (1.44)
Age	70.19 (6.09)
Fall history	0.25 (0.64)
Depression	3.27 (2.35)
Perceived health status	2.72 (0.69)
Number of medications used	3.62 (1.87)

SD, standard deviation; COPD, chronic obstructive pulmonary disease; ADL, Activities of Daily Living.

The item of fall-efficacy with the highest mean score among the participants was walking around inside the house (mean = 9.44, SD = 1.28), followed by preparing a simple meal (mean = 9.08, SD = 1.59) and light housekeeping (mean = 8.98, SD = 1.61). In contrast, the item with the lowest mean score was using front or rear steps at home (mean = 7.51, SD = 2.48), followed by crossing roads (mean = 7.76, SD = 2.31) and reaching into cabinets or closets (mean = 7.93, SD = 2.34). Detailed results are presented in Table 3.

Table 3 Mean and Standard Deviation of Fall-Efficacy by Item among Older Adults with COPD (n=126)

Item	Mean (SD)
Walk around the inside of your house	9.44 (1.28)
Prepare a simple meal	9.08 (1.59)
Light housekeeping	8.98 (1.61)
Get dressed and undressed	8.90 (1.72)
Get in/out of a chair	8.89 (1.73)
Answer the door or telephone	8.89 (1.56)
Light gardening or hanging out the washing	8.81 (1.76)
Get in/out of bed	8.78 (1.83)
Simple shopping	8.67 (2.01)
Take a bath or a shower	8.34 (2.26)
Using public transport	8.30 (2.11)
Reach into cabinets or closet	7.93 (2.34)
Crossing roads	7.76 (2.31)
Using front or rear steps at home	7.51 (2.48)
Mean score of fall-efficacy	8.59 (1.52)

COPD, chronic obstructive pulmonary disease; SD, standard deviation.

The results indicated strong negative correlations between depression, balance ability, COPD-related health impact, and fall-efficacy ($\rho = -0.641$, $p < 0.001$; $\rho = -0.543$, $p < 0.001$; and $\rho = -0.508$, $p < 0.001$, respectively). Moderate negative correlations were observed for perceived health status and number of medications used ($\rho = -0.444$, $p < 0.001$ and $\rho = -0.326$, $p < 0.001$, respectively). Age showed a weak negative correlation with fall-efficacy ($\rho = -0.259$, $p = 0.003$),

whereas ADL showed a weak positive correlation (ρ = 0.182, p = 0.041). No significant correlation was found between fall history and fall-efficacy (ρ = -0.147, p = 0.099). The detailed results are shown in Table 4.

Table 4 Correlations Between Fall-Efficacy and Selected Variables in older adults with COPD (n=126)

Variables	ρ	*p*-value
Depression	- 0.641***	<.001
Balance ability	- 0.543***	<.001
COPD-related health impact	- 0.508***	<.001
Perceived health status	- 0.444***	<.001
Number of medications used	- 0.326***	<.001
Age	- 0.259**	.003
ADL	0.182*	.041
Fall history	- 0.147	.099

COPD, chronic obstructive pulmonary disease; ADL, Activities of Daily Living.

*p < .05, **p < .01, ***p < .001

Discussion

The study's findings revealed that a significant proportion of participants (66.7%) expressed a high fall-efficacy, and 33.3% indicated low fall-efficacy (mean MFES score = 8.59, SD = 1.52). This finding contrasts with a prior Thai study employing a similar clinical group and utilizing the same MFES, which indicated that the majority of older adults with COPD (68.87%) demonstrated low fall-efficacy[47]. This difference may be explained by the variations of the participant's educational level, fall history, balance impairment, number of medications used, depressive symptoms, perceived health status, and COPD-related health impact.

Although conceptually related, fall-efficacy and fear of falling represent distinct constructs and should not be interpreted interchangeably. Fear of falling reflects an emotional construct characterized by worry and activity restriction, whereas fall-efficacy refers to a cognitive appraisal of one's confidence in performing activities without falling[48,49]. Consistent with this distinction, the present study identified higher fall-efficacy for relatively simple indoor activities and lower fall-efficacy for tasks requiring vertical displacement, complex motor coordination, or exposure to dynamic

environments, such as using steps, crossing roads, and reaching overhead. These patterns align with evidence that older adults with COPD exhibit impaired postural control, altered gait mechanics, and reduced dynamic balance, which may undermine confidence during physically demanding activities[14,49,50].

Within the body functions and structures domain of the ICF framework, balance ability demonstrated a strong negative association with fall-efficacy among older adults with COPD (ρ = -0.543, $p < .001$), indicating that impaired postural control is accompanied by substantially reduced fall-efficacy. This finding supports the study hypothesis. Age- and disease-related pathophysiological changes commonly observed in COPD—such as chronic hypoxemia, sensory and motor neuropathy, musculoskeletal abnormalities, and systemic inflammation—have been shown to impair postural control and balance performance[51,52]. Consequently, compromised balance may restrict safe ambulation, destabilize movement, and diminished fall-efficacy. These findings are consistent with previous studies demonstrating a close relationship between balance impairment and reduced fall-efficacy in older adults with COPD[47,53].

Similarly, COPD-related health impact was strongly and negatively correlated with fall-efficacy (ρ = - 0.508, $p < .001$), indicating that increasing COPD-related health impact is associated with lower fall-efficacy. Medium to high impact of COPD is typically characterized by persistent dyspnea, fatigue, and declining physical activity levels[54,55], which contribute to peripheral muscle dysfunction and reduced exercise capacity[56]. Therefore, COPD-related health impact may influence fall-efficacy more globally through cumulative physiological burden, activity restriction, and having fall experiences. In line with previous studies, it has been reported that 45–58% of individuals with higher COPD-related health impact exhibit low fall-efficacy[47,53].

In the activities and participation domain, ADL showed a statistically significant positive correlation with fall-efficacy among older adults with COPD (ρ = 0.182, $p = .041$). This finding indicated that individuals with increased independence in daily activities are likely to report higher fall-efficacy, whereas reduced ADL performance is associated with lower fall-efficacy. This correlation can be explained by the fact that COPD-related symptoms such as persistent dyspnea and fatigue progressively restrict engagement in daily activities, leading to reduced functional independence[57]. They need more help in ADL, which will make them more insecure about their physical abilities, and then fall-efficacy becomes lower[21].

In the present study, participants exhibited a high level of independence in ADL (mean = 99.64, SD = 1.44). This almost general functional profile could explain the rationale for the statistically significant, however small, correlation between ADL and fall-efficacy. Similar associations between ADL performance and fall-efficacy have been reported in previous studies involving older adults with COPD[53,58].

Within the personal factors domain, age demonstrated a statistically significant negative association with fall-efficacy among older adults with COPD (ρ = - 0.259, p = .003), indicating that advancing age is accompanied by a gradual decline in fall-efficacy. As age increases, lung function declines, changes occur in the structure of the lungs, and the defense mechanisms become weaker, making the lungs more susceptible to infections, which in turn leads to acute exacerbations[59]. During exacerbations, heightened dyspnea, fatigue, and physiological stress—such as tachycardia and breathlessness—may amplify bodily signals of vulnerability[60]. Consistent with this mechanism, previous studies have reported reduced fall-efficacy among older adults with COPD at more advanced ages[58].

In contrast, fall history was not significantly associated with fall-efficacy in the present study (ρ = - 0.147, p = .099), contrary to the initial hypothesis. Although individuals with COPD are known to have a higher prevalence of falls and fall-related injuries—which often lead to functional decline and increased mortality[61,62]. This finding may reflect limited variability in fall experience; most participants (81.7%) reported no falls in the past year, which may have reduced the detectable associations between prior falls and fall-efficacy. Similar nonsignificant associations between fall history and fall-efficacy have been reported in previous studies of older adults with COPD[58].

Depression demonstrated a strong negative association with fall-efficacy (ρ = - 0.641, p < .001), representing one of the most influential personal factors identified in this study. Older adults with higher depressive symptom severity reported markedly lower fall-efficacy. Depression is highly prevalent in COPD[63]. Multiple biological, behavioral, and psychosocial mechanisms lead to depression in COPD patients[63,64], and therefore, it is often accompanied by low fall-efficacy. This finding is consistent with prior evidence in older adults with COPD[47,58].

Perceived health status also showed a statistically significant moderate negative association with fall-efficacy (ρ = - 0.444, p < .001), indicating that the better the perceived health status, the higher the fall-efficacy. Conversely, the worse the perceived health status, the lower the fall-efficacy. Perceived health reflects an integrative subjective appraisal of physical, psychological, and social

well-being and has been shown to strongly influence individuals' beliefs regarding their functional capacity[38]. When older adults perceive their health as poor, they may exhibit reduced fall-efficacy[21].

Within the environmental factor domain, the number of medications used demonstrated a statistically significant moderate negative association with fall-efficacy among older adults with COPD ($\rho = -0.326$, $p < .001$), indicating that a greater number of medications used is associated with lower fall-efficacy. In the present study, nearly half of participants (46.1%) reported using four or more medications, reflecting a clinically meaningful level of polypharmacy. Management of COPD typically requires long-term use of multiple pharmacological agents, including bronchodilators, inhaled or systemic corticosteroids, and medications prescribed for comorbid conditions that have been associated with osteoporosis, muscle weakness, and impaired postural control, thereby increasing fall risk[65,66]. Therefore, it is often accompanied by low fall-efficacy. This result is consistent with studies in older adults with COPD[47].

In this study, the researchers only investigated the fall-efficacy of older adults with COPD who visited the respiratory medicine outpatient department. However, they did not study older adults with COPD in the acute exacerbation stage. Therefore, in future studies, it is possible to further explore the fall-efficacy and associate factors of this population. Additionally, based on this study, future research can further investigate the predictive factors of fall-efficacy in older adults with COPD.

Conclusion

In summary, this study indicates that older adults with COPD demonstrate high fall-efficacy, with greater fall-efficacy in common indoor-type activities and lower fall-efficacy in outdoor-type activities that require dynamic movement, postural transitions, and environmental complexity. Within a World Health Organization-aligned ICF framework, fall-efficacy was strongly associated with depression, balance ability, COPD-related health impact, moderately associated with perceived health status and number of medications used, and weakly associated with age and ADL, whereas fall history was not significantly associated.

The findings suggest that multifactorial assessment of fall-efficacy based on the ICF may be valuable. Since this cross-sectional study cannot determine causal relationships, interventions related to depression management, balance training, pulmonary rehabilitation, comprehensive medication assessment and deprescribing procedures, as well as the development of personalized ADL training programs, need to be further verified through future research.

Ethical Approval Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of Burapha University, Thailand (approval no. IRB 3-137/2567, September 20, 2024), and Ethics Committee in Clinical Research of the First Affiliated Hospital of Wenzhou Medical University, China (approval no. KY2024-264, November 16, 2024). All participants were informed of the study's objectives, and written informed consent was obtained from each participant prior to participation in the study.

Author Contributions

JF participated in the conceptualization and design of the study, literature review, reliability testing of research instruments, data collecting, data analysis, interpretation, and discussion of the preliminary research findings under the supervision of NP and KP. NP reanalyzed the data, directed the manuscript development and critical revision of the manuscript, and performed as the principal author. KP thoroughly reviewed the manuscript, providing significant academic suggestions. All authors reviewed and approved the final version of the manuscript prior to submission for publication.

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Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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