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Current status and influencing factors analysis of respiratory function exercise adherence among middle-aged and elderly patients with chronic obstructive pulmonary disease in primary care settings

Jixing Huang[1], Chao Liu[2], Yao Chen[1*]

[1]Department of General Internal Medicine, The People's Hospital of Gaoxian, Yibin, China
[2]Department of General Surgery, Ach Medical University, Ulaanbaatar, Mongolia

*Corresponding author:
Yao Chen;
Department of General Internal Medicine, The People's Hospital of Gaoxian, Yibin, China;
18380445091@163.com

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) seriously threatens the quality of life in middle-aged and elderly populations. Respiratory function exercise is a core non-pharmacological treatment, yet patient adherence is often suboptimal. This study aimed to analyze the factors influencing adherence to respiratory function exercise among middle-aged and elderly COPD patients in primary care settings, providing a reference for clinical intervention.

Methods: A cross sectional study that employs a total of 100 middle-aged and elderly COPD patients admitted to The People's Hospital of Gaoxian from February 2025 to January 2026 was selected. All participants were hospitalized patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD). General demographic data were collected, and assessments were conducted using anxiety, depression, and social support scales. Adherence to respiratory function exercise was also evaluated. SPSSAU software was used for statistical analysis. Univariate analysis employed the χ^2 test, and multivariate analysis employed logistic regression.

Results: Among the 100 patients, 64 (64%) exhibited poor adherence, while 36 (36%) exhibited good adherence. Multivariate logistic regression analysis revealed that age ≤70 years (OR=0.145), educational level of junior high school or below, disease duration <5 years, drug dependence, and anxiety were all risk factors for poor adherence to respiratory function exercise.

Conclusion: Adherence to respiratory function exercise in middle-aged and elderly COPD patients is associated with age, educational level, disease duration, drug dependence, and anxiety. Clinical practice should address these factors with targeted measures to improve adherence and prognosis.

Keywords: chronic obstructive pulmonary disease; factor analysis; middle-aged and elderly; respiratory function tests; statistical.

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (abbreviated as COPD), a prevalent chronic respiratory condition in clinical practice, has emerged as a significant global public health issue due to its high incidence, high disability rate, and substantial economic burden.[1] The prevalence of COPD has shown a marked increase among middle-aged and elderly populations, posing a severe threat to patients' daily quality of life and simultaneously imposing a heavy burden on families and society. As a core component of non-pharmacological treatment for COPD, respiratory function exercise aims to improve patients' lung function, alleviate symptoms, enhance exercise tolerance, and improve quality of life.[2,3]

However, adherence to prescribed respiratory function exercises among middle-aged and elderly COPD patients is often influenced by various factors, leading to suboptimal exercise outcomes and affecting overall disease management. Given the importance of adherence and the challenges faced, conducting an in-depth analysis of the factors influencing adherence to respiratory function exercise and formulating effective interventions based on these findings are of great significance for improving treatment efficacy and quality of life in these patients.[4–8] In light of this, this study aims to analyze the factors influencing adherence to respiratory function exercise among middle-aged and elderly COPD patients, in order to provide a scientific basis and practical guidance for improving patient adherence to these exercises.

METHODS

Study Population and Selection Criteria

In this observational study, which employs a cross-sectional design, a total of 100 middle-aged and elderly patients with COPD admitted to Gaoxian People's Hospital between February 2025 and January 2026 were recruited as research subjects. The inclusion criteria required that participants met the established diagnostic criteria for COPD, were aged 45 years or older, were in a relatively stable phase of the disease, and possessed a normal mental state capable of effective communication. Patients were excluded if they had experienced an acute exacerbation within the two weeks prior to the study, or if they presented with comorbid pulmonary diseases, acute infections, malignant tumors, autoimmune diseases, or limb dysfunction.

Data Collection and Demographic Variables

General demographic and clinical data were extracted from existing admission records or collected via an in-hospital questionnaire, encompassing variables such as gender, age, education level, disease duration, the presence of hypertension or diabetes, drug dependence, and family history.

Assessment of Psychological Status and Social Support

Psychological status was evaluated using the Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS), both of which consist of 20 items scored on a 4-point scale. For both assessments, the total raw score was multiplied by 1.25 and rounded to the nearest integer to yield a final score out of 100; anxiety was defined by a score of 50 or higher, while depression was identified by a score of 53 or higher. Furthermore, the level of social support was measured using the Social Support Rating Scale (SSRS), where a total score of less than 20 out of a maximum 40 points was categorized as low social support.

Evaluation of Adherence to Respiratory Function Exercise

Adherence to respiratory function exercise was assessed using a dedicated scale covering four dimensions: understanding of respiratory exercise knowledge, correct execution of medical instructions, consistent scheduling of exercises, and completion of all exercise items. Each dimension was allocated a maximum of 2 points, and a cumulative score of 4 or higher was utilized to define good adherence, whereas lower scores were classified as poor adherence.

Quality Control and Ethical Considerations

To ensure the validity of the responses and minimize social desirability bias, all questionnaires were completed anonymously in the absence of medical staff. Participants were explicitly informed that their data would be used solely for academic purposes and would not impact their clinical treatment, with all information managed under strict confidentiality.

Statistical Analysis

SPSSAU software was used for statistical analysis of the data. Count data were described as "number or proportion (%)" and analyzed using the χ^2 test. Measurement data conforming to a normal distribution were described as "mean ± standard deviation ($\bar{x}\pm s$)" and analyzed using the t-test; if the distribution was skewed, non-parametric tests were used. With adherence to respiratory function exercise as the dependent variable and the general data collected above as independent variables, variables with statistically significant differences in the univariate analysis were included in a multivariate logistic regression to analyze the risk factors influencing adherence to respiratory function exercise. A P-value <0.05 was considered statistically significant.

RESULTS

Current Status of Adherence to Respiratory Function Exercise.

Among the 100 middle-aged and elderly COPD patients, 64 cases (64.00%) exhibited poor adherence, while 36 cases (36.00%) exhibited good adherence to respiratory function exercise.

Univariate Analysis of Factors Influencing Adherence to Respiratory Function Exercise in Middle-aged and Elderly COPD Patients.

The univariate analysis revealed that educational level, disease duration, drug dependence, anxiety and depression status, and level of social support were associated with adherence to respiratory function exercise in COPD patients, with all differences being statistically significant (P values all <0.05). See Table 1.

Multivariate Logistic Regression Analysis of Factors Influencing Adherence to Respiratory Function Exercise in Middle-aged and Elderly COPD Patients.

The multivariate logistic regression analysis revealed that an education level of junior high school or below, a disease duration of less than 5 years, drug dependence, the presence of anxiety, and age ≤70 years were all risk factors for poor adherence to respiratory function exercise in middle-aged and elderly COPD patients (all P values <0.05; Table 2).

DISCUSSION

Chronic Obstructive Pulmonary Disease (COPD) is a chronic inflammatory lung condition that predominantly affects middle-aged and elderly individuals. While its exact pathogenesis has not been fully elucidated, it is considered to be associated with factors such as long-term smoking, recurrent respiratory infections, and air pollution. Patients typically present with symptoms like chronic cough, sputum production, and dyspnea, which significantly impair daily life.[9] Respiratory function exercise is crucial for middle-aged and elderly COPD patients, aiding in improving respiratory function, enhancing physical capacity, reducing the frequency of acute exacerbations, and elevating quality of life. However, clinical studies indicate that adherence to respiratory function exercise among these patients is generally low, influenced by various factors, potentially leading to further deterioration of respiratory function and disease progression.[10] Therefore, it is clinically essential to identify the factors affecting adherence to respiratory function exercise in this population and implement

effective interventions accordingly to improve adherence and prognosis.

As a non-pharmacological treatment, respiratory function exercise requires patients to possess a certain level of disease knowledge and exercise techniques. Patients with lower educational attainment may struggle to fully comprehend the importance and specific procedures of the exercises, thereby affecting their motivation and accuracy.[11] Concurrently, these patients may have less exposure to and use of modern informational tools such as the internet and e-books, limiting their access to disease-related knowledge and exercise guidance. In contrast, patients with higher education levels are more likely to acquire the latest medical information and professional exercise guidance through various channels.[4]

Table 1. Univariate and bivariate analysis of factors influencing adherence to respiratory function exercise in middle-aged and elderly patients with COPD

Variable	Poor Adherence Group	Good Adherence Group	X^2	P
Gender			3.584	0.058
Male	42	30		
Female	22	6		
Age Group (years)			3.752	0.153
<60	8	5		
60-70	11	12		
>70	45	19		
Education Level			37.771	<0.001*
Junior high or below	63	17		
High school or above	1	19		
Disease Duration			3.260	0.071
<5 years	9	1		
≥5 years	55	35		
Comorbid Hypertension			0.724	0.395
Yes	25	11		
No	39	25		
Comorbid Diabetes			0.031	0.861
Yes	6	3		
No	58	33		
Drug Dependence			2.756	0.097
Yes	11	2		
No	53	34		
Family History			0.354	0.552
Yes	2	2		
No	62	34		
Anxiety Status			15.016	<0.001*
Present	27	2		
Absent	37	34		
Depression Status			10.792	0.001*
Present	25	3		
Absent	39	33		
Social Support Level			9.157	0.002*
High	50	36		
Low	14	0		

Note:*p<0,05

Furthermore, patients with lower education may hold less firm beliefs regarding health maintenance and disease prevention. They might lack sufficient awareness of the severity of COPD and understanding of the long-term benefits of respiratory function exercise. This deficit in belief could lead to insufficient emphasis on exercise, ultimately impacting adherence. Previous studies indicated that adherence to respiratory muscle training among middle-aged and elderly COPD patients is generally low, which may be related to factors such as short disease duration, low educational level, negative emotions, and low social support.[12,13] This finding requires clinical attention and is consistent with the results of this study.

Patients with a shorter duration of COPD may not yet fully recognize the severity and chronicity of the disease. They often lack an in-depth understanding of the pathophysiological process, disease progression, and the importance of respiratory function exercise in COPD management. This insufficient knowledge can lead to a lack of emphasis on exercise, thereby affecting adherence.[14] Additionally, in the early stages of the disease, COPD symptoms are relatively mild and may not command enough attention. As the disease progresses and symptoms worsen, patients may gradually become aware of the necessity of exercise.

Drug dependence may lead to physiological and psychological changes in middle-aged and elderly COPD patients, subsequently affecting their ability and motivation to perform respiratory function exercises. For instance, certain medications may cause side effects such as sedation or drowsiness, reducing patient alertness and activity levels, making it difficult to adhere to a regular exercise regimen.[15]

COPD, being a chronic disease with a prolonged course and recurring symptoms, predisposes patients to negative emotions such as anxiety and depression. These emotions, as part of the psychological stress response, can impair cognitive function, emotional regulation,

Table 2. Determinants of respiratory exercise adherence in middle-aged and elderly COPD patients.

Variable	Assignment	β	SE	χ^2	P-value
Dependent Variable					
Adherence to Respiratory Function Exercise	Good = 0; Poor = 1	—	—	—	—
Independent Variables					
Sex	Male = 0; Female = 1	0.540	0.855	0.4	0.527
Age	>70 years = 0; ≤70 years = 1	-1.930	0.797	5.8	0.015*
Education Level	High school or above = 0; Junior high or below = 1	4.564	1.338	11.6	0.001*
Disease Duration	≥5 years = 0; <5 years = 1	4.369	2.020	4.6	0.031*
Drug Dependence	No = 0; Yes = 1	3.169	1.484	4.5	0.033*
Anxiety Status	Absent = 0; Present = 1	2.442	1.099	4.9	0.026*
Depression Status	Absent = 0; Present = 1	1.110	1.116	0.9	0.320
Social Support Level	High = 0; Low = 1	21.169	14484.678	0.0	0.999
Constant	—	-4.042	1.272	10.0	0.001*

Note: *p<0,05

and self-management capabilities, thereby reducing adherence and motivation for respiratory function exercise.[16] Moreover, anxiety and depression can affect the autonomic nervous and endocrine systems, leading to physiological changes such as tachypnea, tachycardia, and elevated blood pressure. These reactions can exacerbate respiratory symptoms, ultimately fostering a resistance to engaging in respiratory function exercise.

Social support, as a crucial psychological resource, helps individuals cope with life stressors and disease challenges. For middle-aged and elderly COPD patients, social support can provide emotional comfort, informational guidance, and practical assistance, aiding in alleviating the psychological stress induced by the disease.[17] However, when social support levels are low, patients may face greater psychological pressure and feelings of loneliness. These negative emotions can significantly diminish their enthusiasm and adherence to respiratory function exercise.

To address the identified influencing factors, health education is systematically strengthened through regular sessions conducted at least once weekly. Multimedia resources, including illustrations, videos, and animations, are utilized alongside simplified text and accessible language to ensure comprehensive understanding among patients with diverse educational backgrounds. The educational curriculum is designed to encompass fundamental COPD knowledge, the clinical significance of respiratory function exercises, specific training methodologies, and necessary safety precautions. Furthermore, the integration of successful case studies is emphasized within these sessions to provide practical evidence of efficacy and enhance patient motivation, thereby fostering more robust adherence to the prescribed non-pharmacological interventions.

To optimize therapeutic outcomes and ensure patient safety, personalized exercise plans are implemented through a strategy of gradual progression, initiated with fundamental breathing techniques and followed by incremental increases in both intensity and duration. Throughout the intervention, the exercise process is strictly supervised by healthcare professionals, by whom the patient's physical performance and physiological responses are systematically recorded. Consequently, these exercise protocols are dynamically adjusted in response to the patient's real-time clinical status and functional progress, ensuring that the rehabilitation remains both safe and efficacious for the individual.[18] Medication Management and Psychological Intervention: For patients with drug dependence, establish medication records and guide them on proper medication use. Provide regular education on medication knowledge. Employ psychological intervention methods such as cognitive-behavioral therapy and music therapy to help patients identify and modify maladaptive thought patterns, thereby alleviating psychological stress. Simultaneously, establish a psychological counseling hotline to offer patients accessible and timely psychological support.

To strengthen the social support framework, peer support groups are established to facilitate the exchange of personal experiences and mutual encouragement among patients. Furthermore, diverse resources from family members, community volunteers, and social organizations are mobilized to ensure that comprehensive assistance is rendered. Through this multifaceted approach, emotional comfort, financial aid, and practical support are provided, thereby mitigating the psychological burden and enhancing the overall resilience of patients in managing the challenges of the disease.[19]

In this study, we acknowledge that completing questionnaires in a hospital setting may exert potential effects on patients' self-reported compliance and psychological assessments. Patients may exhibit social desirability bias

under medical supervision, leading to overestimated adherence and biased psychological scores. Hospital-related anxiety and unfamiliarity may further distort self-evaluations of emotional status, which could reduce the external validity of the findings. In contrast, home and community environments reflect daily life more realistically and provide higher ecological validity.

To minimize such bias, we adopted anonymous completion, non-attendance of medical staff, confidential data management, and standardized instructions. Nevertheless, the hospital setting remains an inherent limitation of this study. Future studies are recommended to adopt longitudinal designs with repeated assessments across hospital, home, and community settings to capture more authentic behavioral and psychological changes. Accordingly, caution should be taken when interpreting and generalizing the present results, especially for community-based interventions and practical clinical applications.

CONCLUSION

In summary, risk factors such as being aged ≤70 years, having an educational level of junior high school or lower, a disease duration of less than 5 years, drug dependence, and anxiety can negatively influence adherence to respiratory exercise among middle-aged and elderly COPD patients. Based on these insights, clinical practices should consider targeted strategies like intensified health education, phone follow-ups, medication management, psychological support, and strengthened social support systems. Nevertheless, the study's limitations—including a relatively small sample size—may affect the results' reliability. Future research should aim to enlarge the sample and explore these adherence factors more comprehensively to yield stronger evidence for clinical application.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS.

Jixing Huang: Research design and methodology development, data collection and organization, manuscript writing and revision.

Chao Liu: Statistical analysis of data, manuscript review and editing, critical intellectual review, and guidance of the article's content.

Yao Chen: Data collection and organization, manuscript review and editing, critical intellectual review, and guidance of the article's content.

MEDICAL ETHICS

This study was approved by the Medical Ethics Committee. Approval No.: 2025gxry12. Written informed consent was obtained from all participants included in this study.

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GENERATIVE AI DISCLOSURE

The authors declare that no generative AI or AI-assisted writing tools were utilized during the preparation of this manuscript.

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