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Postoperative Symptom Cluster in NSCLC Patients and Its Relationship with Social Support and Self-Efficacy: A Cross-Sectional Study

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Purpose: The study aimed to identify symptom clusters among NSCLC patients within 3 months postoperatively and analyze the relationships between symptom clusters and social support and self-efficacy.

Methods: We conducted a cross-sectional study from January 1 to May 31, 2024, involving NSCLC patients undergoing surgery at hospitals in Jiangsu Province. Data were collected using the MD Anderson Symptom Inventory, the Perceived Social Support Scale (PSSS), and the Strategies Used by People to Promote Health (SUPPH).

Results: Exploratory factor analysis revealed five distinct symptom clusters: respiratory distress, respiratory tract discomfort, physical exhaustion, digestive dysfunction, and nighttime disturbances. The severity of physical exhaustion and nighttime disturbances was negatively correlated with PSSS scores. Conversely, the severity of respiratory distress, respiratory tract discomfort, and digestive dysfunction symptoms was negatively correlated with SUPPH scores.

Conclusion: Our findings may guide medical professionals in managing postoperative symptoms in NSCLC patients. Social support and self-efficacy appear to be significant factors influencing the severity of symptom clusters.

Keywords: NSCLC, symptom clusters, social support, self-efficacy, cross-sectional survey

Introduction

Lung cancer is a prevalent malignancy in China, presenting a significant threat to the population.[1,2] According to the latest data from the International Agency for Research on Cancer, there were 2,480,675 new cases of lung cancer and 1,817,469 deaths globally in 2022, making it the most common cancer worldwide. In China alone, there were 1,060,584 new cases and 733,291 deaths from lung cancer, the highest incidence and mortality rates among all cancers.[3]

Non-small cell lung cancer (NSCLC) accounts for over 80% of all lung cancer cases.[4] Advances in medical imaging technology and the increased use of routine physical examinations have led to more frequent detection of early-stage NSCLC.[5,6] Current guidelines recommend surgical resection as the primary treatment for early-stage NSCLC, which includes clinical stages I and II, as well as resectable stage IIIA.[4,7,8]

Enhanced recovery after surgery protocols for lung cancer patients have significantly improved postoperative outcomes.[9,10] However, studies have identified persistent physical symptoms following surgery.[11,12] Fagundes et al[11] surveyed 60 patients with stage I or II NSCLC within three months postoperatively and found fatigue, pain, dyspnea, sleep disturbances, and drowsiness to be prominent symptoms. Similarly, Tang et al[12] examined 424 postoperative lung

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cancer patients and reported severe postoperative symptoms including pain, fatigue, coughing, shortness of breath, and disturbed sleep.

Further research into postoperative symptoms in early-stage lung cancer has focused on identifying symptom clusters following surgery. Lin et al[13] found that pain, fatigue, disturbed sleep, and distress frequently co-occurred as a common symptom cluster in surgical lung cancer patients. Li et al[14] identified seven distinct symptom clusters: lung cancer-specific symptoms, sleep disturbances, nervous system symptoms, nutritional issues, gastrointestinal symptoms, psychological symptoms, and respiratory symptoms. Additionally, Chen et al[15] distinguished five distinct symptom clusters among elderly postoperative lung cancer patients: mental function (both special and global), sensory symptoms, digestive function, and respiratory function.

Recent studies highlight the importance of understanding how postoperative symptoms or symptom clusters impact the quality of life in lung cancer surgery patients.[15–17] Symptom clusters, defined by concurrent symptoms that often co-occur and may share common mechanisms, profoundly affect both physical and psychological well-being during recovery.[18]

Social support and self-efficacy have emerged as critical factors in managing postoperative symptoms in lung cancer patients.[19,20] Social support, which includes emotional, informational, and instrumental assistance from family, friends, and healthcare providers, plays a significant role in how patients cope with postoperative symptoms.[21] Research indicates that higher levels of social support are associated with better symptom management, reduced distress, and improved overall recovery following lung cancer surgery.[20,22,23]

Similarly, self-efficacy, defined as an individual's belief in their ability to manage symptoms and health-related behaviors, plays a crucial role in reducing the impact of postoperative symptoms.[24] Higher levels of self-efficacy are linked to greater adherence to proactive symptom management strategies and rehabilitation programs following surgery.[23,25,26]

A comprehensive understanding of the psychosocial factors—social support and self-efficacy—and their interaction with postoperative symptom clusters is essential for developing targeted interventions that optimize patient outcomes and enhance quality of life. This cross-sectional study aims to explore these relationships specifically among early-stage NSCLC patients undergoing surgical resection, paving the way for tailored supportive care and rehabilitation strategies.

Materials and Methods

Participants

A cross-sectional study was conducted on NSCLC patients who completed a face-to-face questionnaire between January and May 2024. Sample sizes are typically calculated based on a factor of 5–10 times the number of independent variables.[27] Accounting for a potential 20% loss to follow-up, our final confirmed sample size was 280. The inclusion criteria were: (1) diagnosis of TNM stage I–II or resectable stage IIIA; (2) patients aged ≥18 years; (3) thoracoscopic radical resection of lung cancer; and (4) willingness to participate and signed informed consent. Exclusion criteria included: (1) severe cognitive dysfunction or affective disorder; and (2) serious organ dysfunction. Withdrawal criteria were: (1) secondary surgery; (2) death during the study period; and (3) additional chemoradiotherapy during the study period.

Variables and Measures

Basic Data of Patients

A self-designed questionnaire was administered upon admission, collecting socio-demographic and disease-related data, including gender, income, education level, comorbidities, and surgical modality.

Lung Cancer Module of the MD Anderson Symptom Inventory (MDASI-L)

MDASI is a widely used scale for assessing symptoms in cancer patients.[28] The scale consists of two parts: 13 items that assess common symptoms in cancer patients and six items that evaluate the distress these symptoms cause in the patient's life. The Chinese version was revised to include six additional items: cough, expectoration, hemoptysis, chest tightness,

constipation, and weight loss. This combined scale has 25 items, with a Cronbach's α of 0.922, indicating high reliability for evaluating symptoms in Chinese lung cancer patients. In this study, only the first part of the combined MDASI scale was used, and further exploratory factor analysis was conducted to identify symptom clusters.

Multidimensional Scale of Perceived Social Support (MPSSS)

MPSSS was developed by Zimet et al[29] to measure the level of perceived social support individuals receive. It consists of three dimensions: family support, friend support, and other social support, with a total of 12 items. Each item is rated on a 7-point Likert scale, with scores ranging from 1 to 7. The total score ranges from 12 to 84, with higher scores indicating greater perceived social support. In this study, the scale's Cronbach's α coefficient was 0.85.

Strategies Used by People to Promote Health (SUPPH)

The SUPPH scale was developed by Lev and Owen[30] and translated into Chinese by Qian in 2011.[31] The scale includes 28 items across three dimensions: self-relaxation, positive attitude, and self-decision. It uses a 5-point rating scale, with higher total scores indicating higher levels of self-efficacy. Scores below 65 indicate low self-efficacy, 66–102 indicate moderate self-efficacy, and scores above 103 indicate high self-efficacy. The scale's total Cronbach's α coefficient is 0.970, indicating excellent reliability.

Procedures

For follow-up data collection after thoracic surgery, we recruited patients meeting the inclusion criteria from the ward. Two researchers, who underwent standardized training, administered the general information questionnaire, MDASI-L, MPSSS, and SUPPH to each patient. Only fully completed questionnaires were considered valid. All patient data collected will be kept confidential and used exclusively for research purposes.

Data Analysis

Data analysis was conducted using the Chinese version of SPSS 22.0 (IBM, Armonk, NY, USA). A p-value < 0.05 was considered statistically significant. Normally distributed measurement data were expressed as mean ± standard deviation, while non-normally distributed data were reported as median and interquartile range. Enumeration data were presented as number (n) and percentage (%). Exploratory factor analysis was employed to define the types and compositions of symptom clusters. The criteria for determining the number of factors included: (1) eigenvalue ≥1; (2) adherence to the steep slope criterion; (3) symptoms with two or more factor loadings ≥0.4 on a single factor; and (4) symptom incidence ≥20%. Spearman rank correlation was used to analyze correlations between symptom clusters and the MPSSS and SUPPH scores.

Results

Patient Characteristics

A total of 280 questionnaires were distributed to 280 participants, of which 266 were completed (recovery rate: 95.00%). The participants' ages ranged from 29 to 83 years, with a mean age of 58.61 ± 6.82 years. Participant characteristics are detailed in Table 1.

Postoperative Symptoms and Symptom Clusters

Within 3 months after surgery, NSCLC patients experienced nineteen symptoms, with cough, fatigue, pain, and chest tightness being the most common (Table 2). Five symptom clusters were identified: respiratory distress, respiratory tract discomfort, physical exhaustion, digestive dysfunction, and nighttime disturbances (Table 3).

Correlations Between Symptom Clusters and Social Support/Self-Efficacy

Within 3 months after NSCLC surgery, the severity of the physical exhaustion and nighttime disturbance symptom clusters was negatively correlated with social support. Additionally, the severity of the respiratory distress, digestive dysfunction, and respiratory tract discomfort symptom clusters was negatively correlated with self-efficacy (Table 4).

Table 1 Characteristics of 266 Patients

Variable	Number	Percentage
Age (years)		
18–40	18	6.77
41–60	126	47.37
≥ 61	122	45.86
Sex		
Female	118	44.36
Male	148	55.64
Underlying diseases		
Hypertension	76	28.57
Coronary heart disease	10	3.76
Diabetes mellitus	30	11.28
Surgical history		
Yes	84	31.58
No	182	68.42
Surgical method		
Wedge cut	62	23.31
Segments cut	82	30.83
Leaves cut	122	45.86
Pathology results		
Carcinoma in situ	56	21.10
Invasive carcinoma	210	78.90

Table 2 Incidence and Severity of Postoperative Symptoms

Symptom	Number	Incidence	Median (IQR)
Pain	208	78.20	2.00 (2.00, 5.00)
Nausea	16	6.02	0.00 (0.00, 0.00)
Emesis	14	5.26	0.00 (0.00, 0.00)
Lack of appetite	88	33.08	0.00 (0.00, 3.00)
Disturbed sleep	176	66.17	2.00 (0.00, 3.00)
Drowsiness	142	53.38	3.00 (0.00, 5.00)
Fatigue	218	81.95	3.00 (2.00, 6.00)
Short of breath	208	78.20	3.00 (3.00, 5.00)
Dry mouth	184	69.17	3.00 (0.00, 5.00)
Memory disturbance	82	30.82	0.00 (0.00, 2.00)
Numbness	78	29.32	0.00 (0.00, 2.00)
Distress	144	54.14	2.00 (0.00, 3.00)
Sadness	34	12.78	0.00 (0.00, 0.00)
Cough	226	84.96	3.00 (3.00, 5.00)
Expectoration	172	64.66	2.00 (0.00, 3.00)
Hemoptysis	20	7.52	0.00 (0.00, 0.00)
Chest tightness	206	77.44	3.00 (2.00, 5.00)
Constipation	86	32.33	0.00 (0.00, 3.00)
Weight loss	94	35.34	0.00 (0.00, 2.00)

Abbreviation: IQR, interquartile range.

Discussion

Incidence and Severity of Postoperative Symptoms and Symptom Clusters

Similar to previous studies,[14,15] patients typically experience a range of symptoms grouped into five clusters in the immediate postoperative period after NSCLC surgery. The respiratory distress symptom cluster includes symptoms such as cough and chest

Table 3 Exploratory Factor Analysis of Symptom Frequency Within 3 months After Surgery

Symptom	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	Respiratory Distress Symptom Cluster	Physical Exhaustion Symptom Cluster	Nighttime Disturbance Symptom Cluster	Digestive Dysfunction Symptom Cluster	Respiratory Tract Discomfort Symptom Cluster
Pain	0.759	0.224	0.023	0.195	0.185
Chest tightness	0.936	0.138	0.116	0.049	0.123
Short of breath	0.933	0.139	0.059	0.035	0.099
Cough	0.194	0.195	0.024	0.103	0.863
Expectoration	0.139	0.062	0.082	0.035	0.913
Dry mouth	0.033	0.775	−0.079	0.265	0.095
Fatigue	0.316	0.544	0.143	0.390	0.069
Numbness	0.172	0.678	0.043	−0.134	0.098
Drowsiness	0.287	0.543	0.114	0.127	−0.039
Memory disturbance	−0.019	0.474	0.284	−0.033	0.244
Lack of appetite	0.162	0.170	−0.161	0.782	0.087
Weight loss	0.072	−0.045	0.131	0.780	0.049
Constipation	0.002	0.064	0.010	0.479	0.001
Disturbed sleep	0.061	0.129	0.942	−0.014	0.048
Distress	0.124	0.077	0.948	0.051	0.052

Table 4 Correlations Between Symptom Clusters and Social Support/Self-Efficacy Within 3 months After Surgery

Project \ Symptom Cluster	Respiratory Distress Symptom Cluster	Physical Exhaustion Symptom Cluster	Nighttime Disturbance Symptom Cluster	Digestive Dysfunction Symptom Cluster	Respiratory Tract Discomfort Symptom Cluster
Social support	0.097	−0.248*	−0.244*	0.112	0.101
Self-efficacy	−0.399†	−0.024	−0.075	−0.307†	−0.281†

Notes: *$P<0.05$; †$P<0.01$.

tightness, which indicate ongoing respiratory challenges and may impact recovery. The respiratory tract discomfort symptom cluster often arises from irritation and inflammation due to surgical interventions, requiring effective management to enhance patient comfort. Additionally, the physical exhaustion symptom cluster is prevalent, with fatigue and related symptoms reflecting the significant toll of the surgery. Targeted interventions are essential to improve functional status and overall well-being. The digestive issues symptom cluster, which includes symptoms like nausea and appetite changes, though less emphasized, is significant and may result from surgical stress or medication side effects. Addressing these digestive issues is crucial for maintaining proper nutrition and overall health. Finally, the nighttime disturbances symptom cluster, characterized by poor sleep quality, can exacerbate other symptoms and hinder recovery. Strategies to address sleep disturbances are important for supporting the healing process. Understanding and addressing these interconnected symptom clusters can help healthcare providers offer more comprehensive care, ultimately improving patient outcomes and quality of life.

Correlation Between Symptom Clusters and Social Support

In this study, the median score for social support was 80 (range 71–84), which is higher than the score reported by Tian et al in a similar population.[32] This discrepancy may be attributed to variations in treatment methods. We found a significant relationship between symptom clusters and social support within three months after NSCLC surgery. Specifically, higher levels of social support were associated with the severity of physical exhaustion and nighttime disturbance symptom clusters. This suggests that social support, encompassing emotional, informational, and practical assistance from family, friends, and healthcare professionals, helps alleviate these symptoms. Such support likely aids

patients in managing stress and emotional burdens, thereby improving sleep quality and facilitating postoperative recovery. Emotional support can reduce feelings of isolation, while practical assistance can address physical and daily challenges. Therefore, healthcare providers should prioritize social support in postoperative care, encourage patients to engage with their support networks, and facilitate access to resources. Future research should explore the mechanisms through which social support impacts symptom severity and develop targeted interventions to enhance support for NSCLC patients during their recovery.

Correlation Between Symptom Clusters and Self-Efficacy

In this study, the median score for self-efficacy was 84 (range 28–112), which aligns with the score reported by Huang et al.[33] We examined the correlation between symptom clusters and self-efficacy within three months following NSCLC surgery. Our findings indicate that lower levels of self-efficacy were associated with greater severity in symptom clusters, including physical exhaustion and nighttime disturbances. This suggests that higher self-efficacy, which reflects a patient's confidence in their ability to manage their health and recovery, can help reduce the severity of these symptoms. Self-efficacy may empower patients to be more actively involved in their recovery process, manage stress, and adhere to treatment plans, thereby improving overall symptom management. Consequently, healthcare providers should consider integrating strategies to enhance self-efficacy into their postoperative care plans. Encouraging patients to build confidence in their ability to manage their recovery and providing them with the necessary tools and support could lead to better symptom control. Future research should investigate the mechanisms through which self-efficacy affects symptom severity and explore targeted interventions to strengthen self-efficacy among NSCLC patients during their recovery.

Limitations and Implications

This study has several limitations. Firstly, given the different pathophysiological features of the pathology results, disparities in postoperative symptoms, support needs, and self-efficacy may exist. Thus, the findings may mainly reflect invasive carcinoma patients and not fully represent all NSCLC patients. Secondly, a potential limitation is that the confounding variables were not adequately controlled. This oversight may, in turn, affect the accuracy of the results and limit the generalizability of the research, thus calling for caution when interpreting and applying the findings. Thirdly, the causal relationships between symptom cluster severity, social support, and self-efficacy have not been fully explored. Future research should include multi-center studies with larger sample sizes and longitudinal designs, and adequately control confounding variables to better understand these relationships.

The study examined the relationship between symptom clusters, social support, and self-efficacy within three months after lung cancer surgery. The results revealed a complex interplay between these factors. Specifically, the severity of symptom clusters was negatively correlated with both social support and self-efficacy, underscoring the importance of addressing these variables in the postoperative care of lung cancer patients. These findings have significant implications for clinical practice and offer a theoretical foundation for enhancing the effectiveness and quality of surgical treatment for lung cancer patients.

Future studies should explore the effectiveness of interventions enhancing social support and self-efficacy for symptom cluster alleviation. Randomized controlled trials can assess structured support groups, counseling, or self-management training for post-surgery lung cancer patients, focusing on self-efficacy improvement and symptom reduction. Investigating the optimal timing and duration of these interventions is crucial for maximum benefits. Using digital health technologies to deliver interventions more accessibly and cost -effectively is a promising direction.

Conclusions

Our findings identified five symptom clusters: respiratory distress, respiratory tract discomfort, physical exhaustion, digestive dysfunction, and nighttime disturbances. The severity of the physical exhaustion and nighttime disturbances clusters was negatively correlated with social support. In contrast, the severity of the respiratory distress, respiratory tract discomfort, and digestive dysfunction clusters was negatively correlated with self-efficacy. These findings may guide

medical staff in implementing effective postoperative symptom management for lung cancer patients. Additionally, social support and self-efficacy may play critical roles in influencing the severity of these symptom clusters.

Ethics Approval

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki and received approval from the Jiangsu Province Hospital and the First Affiliated Hospital with Nanjing Medical University (2023-SRFA-207).

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Consent to Publish

Informed consent was obtained to from all participants prior to their participation.

Consent to Participate

Informed consent was obtained to from all participants prior to their participation.

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Disclosure

The authors declare no competing interests in this work.

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