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# Analysis of the development trajectory and influencing factors of demoralization syndrome in young and middle-aged patients with lung cancer during chemotherapy

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## CITATION

Jin Y, Song Q, Zhong M, et al.  
Analysis of the development trajectory and influencing factors of demoralization syndrome in young and middle-aged patients with lung cancer during chemotherapy. *Psycho-Oncologie*. 2025; 19(3): 4367.  
<https://doi.org/10.18282/po4367>

## ARTICLE INFO

Received: 31 March 2025

Revised: 6 June 2025

Accepted: 9 June 2025

Available online: 14 August 2025

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**Abstract: Objective:** This study aims to investigate the developmental trajectories and influencing factors of demoralization syndrome in young and middle-aged patients with lung cancer. **Methods:** From January to December 2024, 125 young and middle-aged patients with lung cancer from a tertiary Grade A hospital in Jiangxi Province were selected *via* convenience sampling. Data collection included the General Information Questionnaire, Demoralization Scale-II (DS-II), MD Anderson Symptom Inventory (MDASI), and Hospital Anxiety and Depression Scale (HADS). Demoralization syndrome levels were assessed at four time points: prior to the first chemotherapy, after the second chemotherapy, after the fourth chemotherapy, and after the sixth chemotherapy. Latent growth mixture modeling (LGMM) was employed to identify demoralization syndrome trajectories, while multivariate logistic regression analysis determined the factors influencing these trajectories during chemotherapy. **Results:** Three distinct trajectories were identified: high demoralization with fluctuating increase (27.8%), moderate demoralization with slow increase (40.3%), and low demoralization with continuous increase (36.7%). Multivariate logistic regression revealed that patient age, symptom burden, and levels of anxiety and depression significantly influenced the developmental trajectories of demoralization syndrome in these patients ( $P < 0.05$ ). **Conclusion:** Demoralization syndrome levels in young and middle-aged patients with lung cancer undergoing chemotherapy exhibit considerable heterogeneity. Healthcare professionals should monitor variations in demoralization syndrome across patient groups and implement targeted interventions based on the identified influencing factors to mitigate demoralization.

**Keywords:** lung cancer; chemotherapy; disorientation syndrome; symptom burden; influencing factors; latent growth mixture modeling

Demoralization syndrome is a psychological condition characterized by an individual's inability to manage prolonged stress, manifesting as helplessness, hopelessness, lack of purpose, irritability, and frustration. Demoralization syndrome is commonly associated with chronic illnesses, physical disfigurement, social isolation, diminished dignity, and increased dependence on others, fostering a sense of being a burden. This syndrome is particularly prevalent among individuals with chronic health conditions, advanced cancer, and the elderly population [1]. Recent cancer statistics indicate that lung cancer has become the leading cancer globally as of 2022, with approximately 2,481,000 new cases, accounting for 12.4% of all new

cancer diagnoses worldwide [2]. Lung cancer fatalities also comprise 18.7% of all cancer-related deaths. Contributing factors to the rising incidence of lung cancer include environmental pollution driven by industrialization, lifestyle changes, and increased work-family pressures. As a result, the age of onset for lung cancer has declined, with an increasing proportion of patients aged 18 to 64. Notably, the percentage of patients with lung cancer under 40 years of age has risen from 3.2% to 6.5%, reflecting an annual growth rate of 4.5% [3–7]. These trends highlight the growing incidence of lung cancer diagnoses among individuals in their working years. While chemotherapy remains a critical treatment for lung cancer, significantly improving survival rates, it also introduces biological toxicity, leading to substantial psychological and physiological distress. The sustained absence of relief from these adverse effects may induce feelings of inadequacy, negatively influence future outlooks, and ultimately result in a diminished will to live. A review of the literature indicates that patients with lung cancer exhibit lower rates of workforce reintegration, with reported return-to-work rates of 33% and 41% at one and five years post-diagnosis, respectively. These individuals face elevated unemployment rates and an increased likelihood of early retirement [8,9]. Additionally, lung cancer significantly impacts reemployment prospects. A considerable proportion of young and middle-aged patients receive their diagnosis at pivotal stages in their professional careers, with treatment and prognosis often inducing severe psychological distress, including anxiety, illness-related stigma, and fear of recurrence [10]. Studies suggest that 23.7% to 88.8% of cancer individuals experience varying degrees of diminished willpower, which has been linked to impaired social functioning, reduced adherence to treatment regimens, and poorer overall survival. Furthermore, diminished willpower is associated with heightened emotional distress and, in some cases, suicidal ideation. The psychological burden extends beyond patients, exacerbating the emotional and practical challenges faced by their families [11–14]. Existing research on diminished willpower syndrome in patients with lung cancer primarily consists of cross-sectional studies, which fail to capture its dynamic progression throughout treatment. Given the potential variations in this syndrome at different stages of illness, this study employed a longitudinal approach to examine its trajectory across six chemotherapy cycles. Latent growth mixture modeling (LGMM) was utilized to identify developmental patterns, and influencing factors were analyzed to establish a framework for targeted interventions at different treatment stages.

## **1. Research methods**

### **1.1. Population**

The study utilized a convenience sampling method to recruit patients undergoing chemotherapy in the respiratory department of a tertiary hospital in Jiangxi Province between January and December 2024. Inclusion criteria were as follows: 1) a confirmed diagnosis of lung cancer based on pathological, imaging, and clinical evaluations in accordance with National Comprehensive Cancer Network (NCCN) guidelines; 2) age between 18 and 59 years; 3) requirement for at least six cycles of adjuvant chemotherapy; and 4) awareness of their medical condition and provision of informed consent. Exclusion criteria included 1) evidence of recurrence or distant

metastasis; 2) presence of malignant tumors in other organs or significant organ dysfunction; and 3) severe cognitive impairment. Based on principles for sample size estimation in multifactorial analysis [15], the recommended sample size should be 10 to 15 times the number of observed variables. This study identified 13 variables, and accounting for a 15% attrition rate, the total sample size was calculated to be 160 cases. Ultimately, 125 patients completed the longitudinal survey. The study protocol was approved by the hospital's Ethics Committee, and all participants provided written informed consent.

The researcher developed a comprehensive questionnaire consisting of two sections: demographic information and disease-related details. The demographic section collected data on variables such as gender, age, educational level, occupation, marital status, residential status, economic status, and payment methods for medical expenses. The disease-related section included information on tumor stage and the presence of comorbidities.

The Demoralization Scale-II (DS-II), adapted from the original Demoralization Scale (DS) developed by Robinson et al. [16] in 2016 and later revised by Oona et al. in 2021 [17], was used to assess demoralization levels. The DS-II consists of two dimensions and 16 items, each rated on a 3-point Likert scale ("never," "sometimes," and "often"), with scores of 0, 1, and 2, respectively. The total score ranges from 0 to 32, with classifications as follows: a score of  $\leq 9$  indicates mild dysphoria, scores between 10 and 19 represent moderate dysphoria, and scores of  $\geq 20$  reflect severe dysphoria. In this study, the Cronbach's alpha coefficient for the scale was 0.871, demonstrating strong internal consistency.

The MD Anderson Symptom Inventory (MDASI), initially developed by Cleeland in 2000 and adapted into Chinese by Wang in 2004, is a validated tool designed to assess the symptom burden experienced by cancer individuals over the previous 24 h [18,19]. The instrument comprises two sections, totaling 19 items. The first section evaluates the severity of 13 symptoms related to the disease or its treatment, including pain, fatigue, nausea, sleep disturbances, and numbness. The second section measures the impact of these symptoms on daily functioning across six domains: general activities, mood, work (including household tasks), interpersonal relationships, mobility, and overall enjoyment of life. Each item is rated on an 11-point Likert scale from 0 to 10, where 0 indicates "no symptom or interference" and 10 represents "the most severe symptom or interference imaginable." The total scores range from 0 to 130 for symptom severity and from 0 to 60 for symptom interference, with higher scores indicating greater severity and distress. In this study, the Cronbach's alpha coefficient for the scale was 0.884, reflecting excellent internal consistency.

The Hospital Anxiety and Depression Scale (HADS), developed by Zigmond, is a widely used screening tool for assessing anxiety and depression in hospitalized patients [20]. The HADS consists of two subscales: HADS-A, which measures anxiety, and HADS-D, which measures depression. The instrument includes 14 items, each rated on a 4-point Likert scale from 0 to 3. Total scores are interpreted as follows: 0–7 indicates normal levels, 8–10 suggests mild symptoms, 11–14 reflects moderate symptoms, and 15–21 signifies severe symptoms. In this study, the Cronbach's alpha coefficient for the scale was 0.891, indicating strong internal consistency.

## **1.2. Data collection**

The researchers screened patients who met the inclusion criteria based on the study's objectives. A detailed face-to-face explanation of the study's purpose and follow-up procedures was provided to eligible participants, followed by the distribution of questionnaires after obtaining informed consent. Data collection occurred at four time points: before the first chemotherapy session (T1), before the second session (T2), before the fourth session (T3), and before the sixth session (T4). At T1, participants completed the General Information Questionnaire and the DS-II. At T2, they completed DS-II, MDASI, and HADS. At T3 and T4, participants completed only the DS-II. The study initially enrolled 160 young and middle-aged patients with lung cancer undergoing chemotherapy. Valid responses were obtained from 150 participants at T2, 140 at T3, and 125 at T4, with 35 cases lost to follow-up, primarily due to participant withdrawals.

## **1.3. Statistical analysis**

Data analysis was conducted using SPSS version 27.0 and Mplus version 8.7. Frequency analysis was employed for count data, normally distributed measures were expressed as  $x \pm s$ , and non-normally distributed measures were presented as median (P25, P75). Statistical comparisons were made using the chi-square test, *F*-test, and rank-sum test. Repeated measures analysis of variance assessed differences across time points, and multicategorical logistic regression analyses were performed to evaluate factors influencing the classification of demoralization syndrome trajectories. The trajectory categories and their characteristics were identified using latent growth mixture modeling (LGMM), incrementally increasing the number of potential categories. Model fit was assessed using various metrics, including the likelihood ratio test (LMR) based on sample-corrected Bayesian Information Criterion (aBIC), the likelihood ratio test (LMR), and the bootstrap likelihood ratio test (BLR) based on bootstrap likelihood ratio (BLRT). A satisfactory model fit was indicated by lower Akaike Information Criterion (AIC), BIC, and aBIC, a higher entropy value, and *P*-values for LMR and BLRT less than 0.05 [21]. The significance level was set at  $\alpha = 0.05$ .

## **2. Results**

### **Basic information**

A total of 125 patients successfully completed the study, which initially enrolled 130 individuals aged 32 to 59 years. The sample comprised 85 males and 40 females with varied educational backgrounds: 13 participants had completed elementary school or lower, 81 had finished junior or senior high school, 29 held junior college diplomas or higher, and 2 had obtained a bachelor's degree or beyond.

Marital status assessment revealed that 121 participants were married, while 4 were unmarried or widowed. Occupationally, the cohort included 11 farmers, 33 laborers, 17 employees in enterprises and institutions, 57 self-employed or freelance workers, 1 retiree, and 6 unemployed individuals.

Geographically, 54 participants resided in rural areas, while 71 were based in urban settings. Tumor staging classified 6 cases as stage I, 5 as stage II, 42 as stage III, and 72 as stage IV.

Economic analysis of household income showed the following distribution: 3 cases with less than 1000 yuan, 45 cases between 1000 and 3000 yuan, 47 cases between 3000 and 5000 yuan, and 30 cases exceeding 5000 yuan per month. The majority of participants were covered by the New Rural Cooperative Medical Insurance (NRCMI) (53 cases), followed by 72 participants with employee or resident urban medical insurance.

Clinical conditions among participants included 10 cases of hypertension, 7 cases of diabetes mellitus, 3 cases of chronic obstructive pulmonary disease (COPD), 5 cases of chronic hepatitis B, and 2 cases of nephrotic syndrome, with some individuals exhibiting multiple comorbidities. Regarding study metrics, the Disorientation Syndrome Score, Symptom Burden, and Anxiety Depression Score were utilized. The patients' disorientation scores at the four time points prior to their first chemotherapy session and during hospitalization for the second, fourth, and sixth chemotherapy courses were as follows:  $9.16 \pm 4.55$ ,  $12.68 \pm 3.15$ , and  $15.01 \pm 2.01$ . The Anderson Symptom Severity Score was  $38.55 \pm 12.76$ , the Symptom Distress Score was  $25.08 \pm 6.68$ , and the Hospital Anxiety and Depression Score was  $12.27 \pm 2.66$ .

This study aims to identify and classify the trajectories associated with loss-of-mind syndrome. Scores related to demoralization syndrome were incorporated into the LGMM for a cohort of 125 young and middle-aged patients with lung cancer, assessed across four follow-up points. The model was designed as a free estimation time parameter model, with the fitting results for 1 to 5 categories sequentially extracted (**Table 1**). The decision to extract three categories was based on model fitting indices, striving for both parsimony and interpretability. The progression of disorientation syndrome in these patients undergoing chemotherapy was categorized into three distinct groups according to the LGMM model (**Figure 1**).

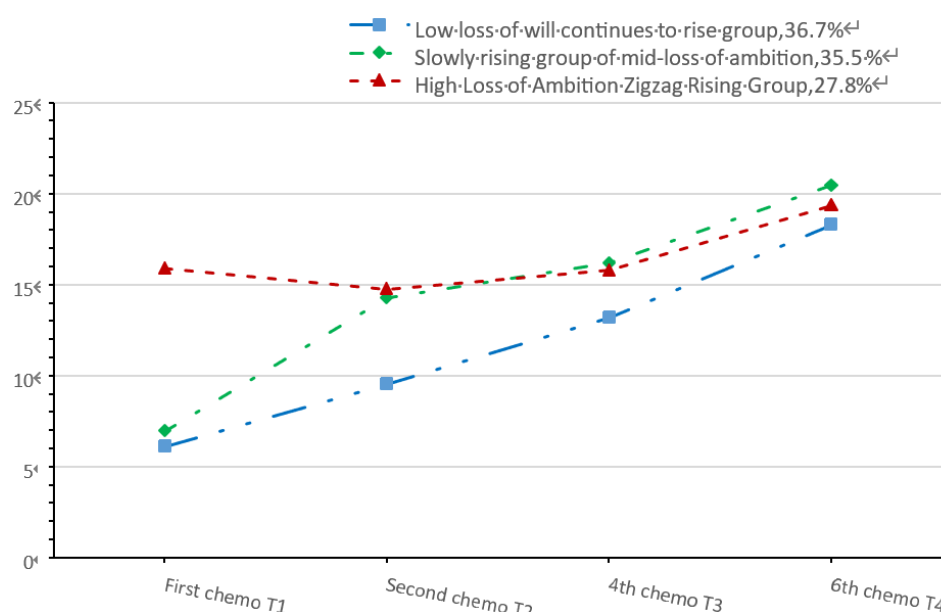


**Figure 1.** Trajectory of change in consciousness syndrome in young and middle-aged patients with lung cancer undergoing chemotherapy.

**Table 1.** Five categories fitting results.

| Molds | AIC      | BIC      | aBIC     | Entropy | LMR(P)  | BLRT(P) | Categorical probability |
|-------|----------|----------|----------|---------|---------|---------|-------------------------|
| 1     | 2607.949 | 2630.576 | 2605.279 |         |         |         |                         |
| 2     | 2490.110 | 2526.878 | 2485.770 | 0.988   | < 0.001 | < 0.001 | 72.1/27.8               |
| 3*    | 2444.571 | 2495.481 | 2438.561 | 0.869   | 0.004   | 0.0051  | 36.7/35.5/27.8          |
| 4     | 2424.754 | 2489.805 | 2417.075 | 0.876   | 0.1782  | 0.1904  | 35.2/36.9/7.7/19.2      |
| 5     | 2409.583 | 2488.776 | 2400.235 | 0.879   | 0.9437  | 0.9526  | 33.8/8.9/18.9/28.3/10.1 |

AIC: Akaike information criterion; BIC: Bayesian information criterion; aBIC: Sample-corrected BIC; entropy; LMR: Lo-Mendell-Rubin; BLRT: Bootstrapped likelihood ratio test; \*: best-fit model.

Category 1 patients displayed a high initial level of dysphoria syndrome, which decreased at the first follow-up but showed a gradual increase in subsequent assessments. This group was labeled the “high dysphoria zigzagging group,” representing 27.8% of the cohort. Category 2 patients exhibited a moderate initial level of dysphoria, with a gradual upward trend throughout follow-up. This group was designated the “medium dysphoria slow increase group,” comprising 35.5% of the total sample. Lastly, Category 3 patients began with a low baseline score for dysphoria syndrome but showed a consistent increase over the follow-up period. Consequently, this group was classified as the “low dysphoria sustained increase group,” accounting for 36.7% of the patient population.

This study also presents a univariate analysis of potential trajectory categories for demoralization syndrome among young and middle-aged patients undergoing chemotherapy for lung cancer. The results show no statistically significant differences in the distribution of various demographic and socioeconomic factors, including marital status, gender, literacy levels, occupational status, per capita monthly family income, types of medical payment, place of residence, tumor stage, and comorbidities ( $P > 0.05$ ). The variables that demonstrated statistically significant differences are outlined in **Table 2**.

**Table 2.** Univariate analysis of potential categories of trajectories of change in demoralization syndrome during chemotherapy in young and middle-aged patients with lung cancer.

| Groups                                       | Age ( $\bar{x} \pm s$ ) | Symptom Severity ( $\bar{x} \pm s$ ) | Symptomatic distress ( $\bar{x} \pm s$ ) | HADS ( $\bar{x} \pm s$ ) |
|----------------------------------------------|-------------------------|--------------------------------------|------------------------------------------|--------------------------|
| High Loss of Ambition Zigzag Rising Group    | 48.65 $\pm$ 6.81        | 40.17 $\pm$ 113.39                   | 24.94 $\pm$ 7.04                         | 13.94 $\pm$ 2.44         |
| Slowly rising group of mid-loss of will      | 51.68 $\pm$ 8.22        | 40.43 $\pm$ 13.22                    | 26.40 $\pm$ 6.40                         | 11.75 $\pm$ 2.63         |
| Low loss of ambition continues to rise group | 53.39 $\pm$ 4.64        | 35.52 $\pm$ 11.46                    | 23.93 $\pm$ 6.57                         | 11.50 $\pm$ 2.32         |
| $F/\chi^2/HC$                                | 5.02                    | 2.09                                 | 1.568                                    | 11.112                   |
| $P$                                          | 0.008                   | 0.067                                | 0.026                                    | <0.001                   |

A multivariate analysis of the developmental trajectories of demoralization syndrome was further performed in young and middle-aged patients with lung cancer undergoing chemotherapy. The dependent variable was categorized according to demoralization syndrome trajectories: Class 1 represents a low, continuously rising disorientation group; Class 2 indicates a medium, slow-rising disorientation group; and Class 3 denotes a high, zigzag-rising disorientation group, with Class 3 serving as the reference category. Independent variables that showed statistically significant

differences in univariate analyses were included in the multivariate logistic regression model. Variables were selected using a forward stepwise method, with significance levels set at  $\alpha_{in} = 0.05$  and  $\alpha_{out} = 0.10$ . The regression model incorporated the following variables: age, symptom severity, symptom distress, and hospital anxiety-depression scores. The likelihood ratio test produced a chi-square value of 28.50 ( $P < 0.001$ ), confirming the statistical significance of the model. Results of the regression analysis are presented in **Table 3**.

**Table 3.** Multivariate logistic regression analysis of factors influencing the trajectory of change in chemotherapy-related demoralization syndrome in young and middle-aged patients with lung cancer.

| Implicit variable   | Independent variable | $\beta$ | SE    | Wald $\chi^2$ | P     | OR    | 95% CI      |       |
|---------------------|----------------------|---------|-------|---------------|-------|-------|-------------|-------|
|                     |                      |         |       |               |       |       | Lower limit | Limit |
| Class 1 vs. Class 3 | Constant             | 3.245   | 3.025 | 1.151         | 0.283 |       |             |       |
|                     | Age                  | 0.057   | 0.04  | 1.970         | 0.006 | 1.058 | 0.978       | 1.145 |
|                     | Symptom severity     | −0.032  | 0.031 | 1.112         | 0.032 | 0.968 | 0.912       | 1.028 |
|                     | Symptomatic distress | −0.001  | 0.061 | 0.000         | 0.020 | 0.999 | 0.887       | 1.126 |
|                     | HADS                 | −0.367  | 0.113 | 10.591        | 0.001 | 0.693 | 0.555       | 0.864 |
| Class2 vs. Class 3  | Constant             | 3.337   | 2.811 | 1.409         | 0.235 |       |             |       |
|                     | Age                  | 0.013   | 0.036 | 0.132         | 0.016 | 1.013 | 0.944       | 1.088 |
|                     | Symptom severity     | −0.016  | 0.029 | 0.308         | 0.029 | 0.984 | 0.929       | 1.042 |
|                     | Symptomatic distress | 0.039   | 0.058 | 0.448         | 0.003 | 1.04  | 0.928       | 1.165 |
|                     | HADS                 | −0.32   | 0.107 | 8.923         | 0.003 | 0.726 | 0.589       | 0.896 |

### 3. Discussions

The findings of this study indicate that young and middle-aged patients with lung cancer undergoing chemotherapy may follow three distinct trajectories regarding loss-of-mind syndrome, revealing considerable heterogeneity within this population. Upon chemotherapy initiation, a general increase in dysphoria levels was observed; however, the rate of increase varied across individuals. Specifically, 27.8% of patients were classified in the high disorientation zigzag rise group, which exhibited elevated disorientation levels at the onset of the follow-up period. This group demonstrated an initial decline at T1, followed by a gradual increase at T2. Elevated demoralization levels prior to chemotherapy may be attributed to the substantial symptom burden and physical discomfort faced by this cohort, compounded by their lack of knowledge regarding the disease and treatment before chemotherapy. Adverse effects associated with the second chemotherapy cycle intensified, leading to increased physical discomfort and a corresponding rise in negative emotional states, including disillusionment. Literature supports that factors such as cancer severity, disease uncertainty, the risk of deterioration, and chemotherapy-related side effects—such as appetite loss, poor sleep quality, and reduced physical function—contribute to negative emotional outcomes, including anxiety and depression [22].

Notably, 35.5% of patients were categorized in the slowly progressing dementia group, which demonstrated a more pronounced increase in dementia severity between the initial and subsequent chemotherapy sessions. This may be attributed to the

neurotoxic effects of the pharmacological agents administered, which, in conjunction with physical discomfort, exacerbated negative emotional states and contributed to worsening dementia. As treatment duration progressed, treatment-related biotoxicity decreased, and patients' understanding and management of their condition improved. Consequently, disorientation levels declined, although the overall trend continued to rise.

The proportion of patients exhibiting low dysphoria who continued to increase was 36.7%. As patients' health declined, psychological distress, symptomatic burden, and apprehension regarding their illness increased, resulting in a progressive rise in dysphoria. This observation suggests that initial assessments of loss-of-will syndrome by healthcare professionals may not accurately reflect its evolution over time during prolonged treatment. To effectively monitor and identify patients at high risk and implement targeted interventions to prevent suicidal ideation and promote mental well-being, it is crucial to recognize the dynamic nature of loss-of-will syndrome and individual variability [23]. Therefore, healthcare professionals should prioritize effective communication with patients, foster an environment that encourages emotional expression, and support the gradual restoration of patients' social functioning to prevent negative outcomes.

Older patients are more susceptible to significant fluctuations in high demoralization syndrome during chemotherapy. The study's findings revealed that older individuals are more likely to be categorized in the high disorientation zigzag ascending group. Age-related declines in physiological functions, such as reduced tissue and organ functionality, diminished metabolic capacity, and decreased bone density, may contribute to a higher symptom burden and prolonged recovery times. These factors may extend the duration during which dementia syndrome remains at lower levels [24]. Xiao's research has demonstrated that cancer patients over 70 years of age receiving chemotherapy were 2.5 times more likely to experience high levels of demoralization than patients under 60 years of age, and the risk of high levels of demoralization increased 1.4 times with each 10-year increase in age. This may be closely related to the higher burden of comorbidities in older patients, weakened social support systems, reduced psychological resilience, and poorer tolerance of chemotherapy-related side effects [25].

In contrast, the young and middle-aged participants in this study, who typically manage more complex familial and social responsibilities, face additional challenges. Besides the prolonged physical discomfort and depletion of physical and mental health from cancer, these pressures may impair their self-regulation capabilities, potentially leading to negative emotional states. Therefore, while symptom relief should be prioritized for young and middle-aged patients with lung cancer, healthcare professionals must also consider the self-regulation capabilities of older patients. This requires careful attention to their psychological needs and the implementation of targeted interventions to address and improve their cognitive and psychological well-being.

Patients experiencing a higher symptom burden are more likely to experience an increase in dementia levels throughout chemotherapy. The study indicates that as symptom severity rises, patients are more likely to fall into the high dysphoria

curvilinear ascending group, highlighting the significant impact of symptom burden on the degree of dysphoria.

Furthermore, the relationship between negative emotional states and symptom burdens in patients with advanced cancers is significant. Specifically, pain is more commonly reported among anxious patients, while depression is more prevalent among those suffering from sleep disturbances and appetite loss. This relationship may arise from pain associated with somatic symptoms exacerbating depression and anxiety, or, conversely, from heightened depression or anxiety leading to increased symptoms through somatization [26]. Morrison's research has demonstrated that worse self-reported assessments of pain frequency, severity, cough, dyspnea, and fatigue—collectively referred to as somatic symptom burdens—are linked to greater emotional distress, including anxiety, depression, and irritability, among patients with lung cancer [27].

Cancer individuals frequently endure a range of debilitating symptoms that significantly impact their quality of life. These symptoms, which include pain, fatigue, hair loss, nausea, and appetite loss, are often linked to either the malignancy itself or the treatment protocols used. The severity of these symptoms varies greatly among individuals, with some patients experiencing more intense effects than others. The psychological consequences of these symptoms can be profound, potentially leading to diminished confidence in treatment options and a pervasive sense of despair about future well-being [28]. In response to these findings, clinical practice must prioritize the proactive prevention and management of symptoms to mitigate the adverse effects of the disease.

The analysis results indicated that an increase in anxiety and depressive symptoms was associated with a higher likelihood of patients entering the high demoralization syndrome zigzag ascending group. This aligns with the findings of Xu [29], whose study similarly identified a connection between emotional distress and demoralization syndrome. It is an acknowledged fact that patients suffering from cancer and who have undergone a course of chemotherapy are subject to considerable discomfort, fatigue arising from the disease, and a range of other symptoms. These are both a consequence of the malignancy itself and the effects of the treatment to which the patients are subject. Furthermore, the aforementioned symptoms are often accompanied by a series of psychological symptoms, including feelings of despair and helplessness with regard to the future.

Additionally, a systematic review by Tang highlighted a significant positive correlation between dysphoria and depression [30]. The financial burden of cancer treatment, coupled with the potential for adverse treatment outcomes and recurrence, leaves patients particularly vulnerable to negative emotional states, including anxiety and depression [31].

This phenomenon may be partly explained by the demographic characteristics of the patients with lung cancer in this study, who were predominantly young and middle-aged. The psychosocial stresses such as career interruptions, family role changes, and survival concerns during chemotherapy make young and middle-aged patients more susceptible to stigma and anxiety. Moreover, the role of inflammatory cytokines, which play a pivotal role in psychobiological regulation, may exacerbate anxiety

levels in patients with lung cancer, further contributing to the development of dysphoria.

Consequently, it is essential for healthcare professionals to promptly identify and manage anxiety, thereby improving the prognosis of patients with lung cancer. In summary, healthcare providers should prioritize young and middle-aged patients with lung cancer who present with a higher symptom burden and elevated anxiety levels. Implementing strategies such as health education, family support, and interventions aimed at fostering positive thinking can enhance patients' confidence in overcoming their illness and alleviate dysphoria.

#### 4. Conclusions

In this study, demoralization syndrome among young and middle-aged patients with lung cancer was classified into three distinct categories: a low disorientation group with a continuous increase, a medium disorientation group with a gradual rise, and a high disorientation group exhibiting a zigzag pattern. This classification highlights the heterogeneity of demoralization syndrome in this patient population undergoing chemotherapy. Factors such as age, symptom burden, and levels of anxiety and depression play significant roles in shaping the varying trajectories of disorientation syndrome. Healthcare professionals can leverage this categorization to devise targeted interventions tailored to the specific characteristics of demoralization syndrome in young and middle-aged patients with lung cancer receiving chemotherapy. However, the study has limitations, including its reliance on patients with lung cancer from a single tertiary general hospital, which may introduce selection bias. Furthermore, the investigation focused solely on the trajectory of disorientation syndrome from prechemotherapy to the completion of six chemotherapy cycles. Future research could benefit from a multicenter approach with a larger sample size to validate and further refine the findings of this study.

**Author contributions:** Conceptualization, YJ and YY; methodology, YJ; software, XL; validation, YC, YX and FY; formal analysis, MZ; investigation, QS; resources, YY; data curation, YY; writing—original draft preparation, YJ; writing—review and editing, YJ; visualization, MZ; supervision, YC; project administration, QS; funding acquisition, YY. All authors have read and agreed to the published version of the manuscript.

**Ethical approval:** The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of The First Affiliated Hospital of Nanchang University [(2024)CDYFYLLK(08-006)] (approval date: January 2025).

**Informed consent statement:** Informed consent was obtained from all subjects involved in the study.

**Conflict of interest:** The authors declare no conflict of interest.

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