

ORIGINAL RESEARCH ARTICLE

The effect of stigma on quality of life in lung cancer patients undergoing chemoradiotherapy: The mediating role of psychological resilience and benefit finding

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Abstract

Many lung cancer patients undergoing chemoradiotherapy experience stigma, which shows a negative association with quality of life. This study investigates the mediating roles of psychological resilience and benefit finding in this relationship. A total of 215 lung cancer patients receiving chemoradiotherapy at a hospital in Shanxi Province between October 2024 and December 2025 were recruited via convenience sampling. They completed a general information questionnaire, the Social Impact Scale, the Benefit Finding Scale, the 10-item Connor–Davidson Resilience Scale, and the European Organisation for Research and Treatment of Cancer Core Quality of Life questionnaire. Stigma was negatively correlated with psychological resilience, benefit finding, all functioning domains, and global health status, whereas positive correlations were observed among psychological resilience, benefit finding, and quality-of-life indicators. Mediation analyses demonstrated that psychological resilience and benefit finding were significant mediators of the relationship between stigma and quality of life. In addition, stigma maintained a significant direct negative association with quality of life. Furthermore, a chain mediating effect through psychological resilience and benefit finding was identified. These findings highlight the relevance of stigma, psychological resilience, and benefit finding to quality of life within this patient population. Future multicenter longitudinal studies are warranted to confirm these associations and elucidate the underlying mechanisms.

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1. Introduction

Lung cancer is one of the most frequently diagnosed malignancies and a leading cause of cancer-related mortality worldwide, with approximately 1.8 million deaths reported in 2020.¹ In 2019, lung cancer accounted for an estimated 4.59 million disability-adjusted life years, representing 18.3% of the global cancer disability-adjusted life year burden.² Surgery remains the primary curative treatment for lung cancer. However, many patients have missed the optimal surgical window at diagnosis and therefore require chemoradiotherapy. Chemoradiotherapy is associated with a range of side effects and complications, and has been linked to poorer psychological well-being, heightened

feelings of stigma, and lower quality of life in lung cancer patients.^{3,4}

Stigma refers to the subjective prejudice and negative cognitive experience that arises from diseases such as cancer, mental illness, or other physically disfiguring conditions.⁵ Cancer-related stigma has been widely documented^{6,7}, and stigmatized patients often lose their social status, experience stereotyping, discrimination, and isolation, and may feel socially excluded.⁸ Stigma is also closely associated with psychological distress, including anxiety, depression, guilt, and shame⁹; accordingly, the National Comprehensive Cancer Network has designated distress as the sixth vital sign in cancer care.¹⁰

Notably, patients with lung cancer may experience even greater stigma compared to those with other malignancies¹¹⁻¹³, partly because smoking is often perceived as a self-inflicted cause. Stigma has increasingly been recognized as a factor linked to poorer quality of life in lung cancer patients undergoing chemoradiotherapy.^{14,15} This issue is particularly salient in clinical oncology settings. In the present study, over half of the lung cancer patients undergoing chemoradiotherapy reported moderate-to-high levels of stigma, and stigma was strongly and negatively associated with quality of life. These findings underscore that stigma represents a significant psychosocial burden in this population that warrants clinical attention. However, the specific pathways through which stigma is associated with quality of life, particularly the potential mediating roles of psychological resilience and benefit finding, remain unclear in this population.¹⁶ The present study therefore examines the relationships among these variables.

Psychological resilience refers to an individual's capacity to effectively manage and adapt to stressful situations.¹⁷ It is negatively correlated with disease stigma, as individuals with high resilience are better able to maintain psychophysiological stability, engage in social activities, and accept illness-related changes, thereby buffering feelings of shame and reducing negative emotions.^{18,19} As reported by some investigations, Lung cancer patients generally exhibit below-moderate levels of psychological resilience²⁰, and improving resilience may enhance their resistance to stigma.^{21,22}

In addition, psychological resilience of lung cancer patients undergoing chemoradiotherapy is positively associated with their quality of life.²³ Thus, the first hypothesis was proposed: psychological resilience can mediate the relationship between stigma and quality of life across lung cancer patients undergoing chemoradiotherapy.

Benefit finding refers to the process by which individuals

adopt an optimistic perspective toward their illness and identify positive and meaningful experiences during the disease course, thereby alleviating negative emotions, enhancing psychological adaptation, and ultimately improving quality of life. Studies have shown that benefit finding levels among lung cancer patients are generally low, particularly in the domains of acceptance and social relationships.²⁴

Higher stigma has been correlated with lower benefit finding²⁵, whereas higher benefit finding is positively associated with quality of life.²⁶ However, whether benefit finding mediates the relationship between stigma and quality of life, specifically in lung cancer patients undergoing chemoradiotherapy, has not yet been examined. Therefore, we proposed our second hypothesis: Benefit finding mediates the relationship between stigma and quality of life in this population.

Psychological resilience is also positively related to benefit finding, which indicates that psychological resilience could positively predict benefit finding.²⁷ The explanation is that those with higher levels of psychological resilience will benefit more from positive behavioral changes, and psychological resilience itself can help patients change negative behaviors. Therefore, the third hypothesis proposed in this study was that stigma is indirectly associated with lung cancer patients' quality of life through psychological resilience and benefit finding. However, no study to date has examined whether psychological resilience and benefit finding function as chain mediators in the relationship between stigma and quality of life in lung cancer patients undergoing chemoradiotherapy.

To address this gap, this study aims to test the following hypotheses:

- (i) H1: Psychological resilience mediates the relationship between stigma and quality of life.
- (ii) H2: Benefit finding mediates the relationship between stigma and quality of life.
- (iii) H3: Psychological resilience and benefit finding have a chain mediating effect on the association between stigma and quality of life.

2. Materials and methods

2.1. Subjects

In line with Kendall's criteria, the sample size must be 5–10 times higher than the project number²⁸ with a consideration of a sample loss rate of 10%. With 30 items in the Quality of Life Questionnaire-C30 (QLQ-C30), and accounting for a 10% invalid response rate, the minimum required sample size was 165. The final sample of 215 participants met this requirement and was considered adequate for the

subsequent structural equation modeling analysis. A total of 215 lung cancer patients who were receiving or had completed chemoradiotherapy (concurrent or sequential) between October 2024 and December 2025 at a tertiary hospital in Shanxi Province were recruited via convenience sampling. Inclusion criteria included: (i) patients ≥ 18 years old; (ii) patients developing lung cancer confirmed through pathological examination, and patients who have undergone chemoradiotherapy because, compared to healthy individuals, lung cancer patients experience long-term quality of life impairment after chemoradiotherapy, particularly in terms of physical health scores^{29,30}; (iii) patients who were able to understand and complete the questionnaire independently; (iv) patients who understood

and agreed to cooperate, and provided informed consent. Exclusion criteria included those with multiple mental illnesses, cognitive impairment, or intellectual disability, and patients with other cancers. Table 1 presents the general data on the research subjects. The current work gained approval from the Medical Ethics Committee.

2.2. Methods

2.2.1. General information questionnaire

The questionnaire was prepared by our research group and included age, gender, place of residence, marital status, education, per capita monthly family income, type of medical insurance, type of pathology, whether surgery was performed, whether chemoradiotherapy was received, etc.

Table 1. General data of lung cancer patients undergoing chemoradiotherapy ($n = 215$)

	Variables	Total samples ($n = 215$)	Constituent ratio (%)
Age	18–45	21	9.8
	46–60	66	30.7
	≥ 60	128	59.5
Gender	Female	65	30.2
	Male	150	69.8
Place of residence	Rural	97	45.1
	Urban	118	54.9
Marital status	Single	3	1.2
	Married	156	72.6
	Divorced	7	3.3
	Widowed	49	22.8
Educational level	Illiterate	30	14.0
	Junior high school and below	104	48.4
	High school/technical Secondary school	66	30.7
	College or above	15	7.0
Average income (CNY)	<2,000	60	27.9
	2,000–5,000	118	54.9
	>5,000	37	17.2
Medical insurance type	Provincial/municipal health Insurance	80	37.2
	Medical insurance for urban Residents	121	56.3
	Other	14	6.5
Pathological type	Small cell carcinoma	84	39.1
	Non-small cell carcinoma	131	60.9
Smoking	Yes	114	53.0
	No	101	47.0
Operation	Yes	67	31.2
	No	148	68.8

2.2.2. Social Impact Scale

The Social Impact Scale (SIS) was proposed by Fife *et al.*³¹ and translated into Chinese by Pan *et al.*³² to measure stigma among lung cancer patients. Altogether, 24 items across four dimensions (internal shame, economic discrimination, social exclusion, social isolation) are included. The Likert-4 scoring method was used, with scores ranging from 1 to 4 (strongly disagree to strongly agree), for an overall score of 24–96 points. A higher score indicates a higher level of stigma. Cronbach's α coefficient was 0.955.

2.2.3. Benefit Finding Scale

The Benefit Finding Scale was proposed by Antoni *et al.*³³ and adapted and translated by Weaver *et al.*³⁴ for measuring benefit finding levels among lung cancer cases. It contains 22 items across six dimensions: acceptance, family relationship, worldview, personal growth, and social relationship. The 5-level Likert scale was used, with points scored from 1 to 5, ranging from none to very much. A higher score indicated a higher level of benefit finding. Cronbach's α coefficient was 0.949.

2.2.4. Psychological Resilience Scale

The Psychological Resilience Scale (Connor–Davidson Resilience Scale [CD-RISC 10]) was developed by Connor *et al.*³⁵ translated and adapted by Wang *et al.*³⁶, and was used to measure the psychological resilience of lung cancer patients. A total of 10 items are included, using a 5-level Likert scale, with points recorded from 1 to 5, from never to almost always. A higher score indicates a higher level of psychological resilience. Cronbach's α coefficient was 0.940.

2.2.5. Quality of Life Questionnaire-C30

The Quality of Life Questionnaire-C30 (QLQ-C30) was developed by the European Organization for Research and Treatment of Cancer and was later translated by Wang *et al.*³⁷ This scale measures quality of life across various cancer types and comprises 30 items. Patients' quality of life was assessed by two subscales, namely, functional domain and general health status, in the current work. Five dimensions were included in the functional domain: physical, role, emotional, cognitive, and social functions. Overall health included two entries. After linear conversion, the scores for each functional area and overall health status ranged from 0 to 100, with higher scores indicating a higher quality of life. Cronbach's α coefficient was 0.932.

2.2.6. Data collection

This survey was conducted through face-to-face interviews. First, the investigators received unified guidance and

training, and the survey's purpose and significance were explained to patients before the formal investigation. When informed consent was obtained from patients, they were asked to complete the survey themselves, and those with poor reading and writing skills were assisted by the investigators. There were 220 questionnaires issued, of which 215 were valid (97.73%).

2.3. Statistical analysis

Data were processed and analyzed using the Statistical Package for Social Sciences software (version 22.0). Enumeration variables were described as component ratios (%), whereas measurement variables were described as mean $\pm$ standard deviation. Correlations among lung cancer patients' stigma, psychological resilience, benefit finding, and quality of life after chemoradiotherapy were examined by Pearson correlation. We also established the structural equation model with Amos 26.0. In addition, the mediating effects were examined using the bootstrap method, with the significance level set at $\alpha = 0.05$.

Common method bias was tested using Harman's single-factor test. All items from the main study variables were subjected to an unrotated exploratory factor analysis. The results showed that 13 factors had eigenvalues greater than 1, and the first factor accounted for 37.32% of the total variance, which is below the 40% threshold, indicating that common method bias was not a serious concern in this study

3. Results

3.1. Common method deviation test

The Harman single-factor method was employed to test for common method bias, and the results showed that 13 factors had eigenvalues > 1 in the absence of rotation. The first factor could explain 37.32% ($< 40\%$), indicating that the current work did not have any common method bias.

3.2. Descriptive statistics and correlation analysis

Table 2 presents the results of the correlation and descriptive statistical analyses. Stigma, benefit finding, psychological resilience, total score in functional areas, and overall health status among lung cancer cases receiving chemoradiotherapy were significantly correlated with one another (Table 2).

3.3. Stigma and quality of life: A chain mediation effect analysis

The structural equation model was established in Amos 26.0, with stigma as the independent variable, quality of life as the dependent variable, and psychological resilience and benefit finding as the mediating variables. The fit indices of

Table 2. Scores and correlation analysis of stigma, psychological resilience, benefit finding, quality of life (*r*)

Variables	Mean ± SD	1	2	3	4	5	6	7	8	9	10
1	60.45 ± 15.49	1									
2	29.05 ± 8.63	-0.747*	1								
3	63.46 ± 16.81	-0.690*	0.800*	1							
4	51.38 ± 27.43	-0.722*	0.759*	0.708*	1						
5	57.29 ± 29.11	-0.693*	0.694*	0.623*	0.806*	1					
6	53.80 ± 23.76	-0.611*	0.665*	0.626*	0.633*	0.601*	1				
7	53.88 ± 24.18	-0.629*	0.610*	0.578*	0.741*	0.686*	0.606*	1			
8	50.62 ± 25.06	-0.677*	0.680*	0.630*	0.732*	0.638*	0.716*	0.722*	1		
9	54.69 ± 20.64	-0.628*	0.710*	0.652*	0.701*	0.600*	0.551*	0.597*	0.657*	1	
10	266.96 ± 112.38	-0.711*	0.788*	0.732*	0.909*	0.873*	0.811*	0.863*	0.873*	0.718*	1

Notes: 1 = Stigma, 2 = Psychological resilience, 3 = Benefit finding, 4 = Physical function, 5 = Role function, 6 = Cognitive function, 7 = Emotional function, 8 = Social function, 9 = General health status, 10 = Total score in functional area. *Indicates $p < 0.01$.

Abbreviation: SD: Standard deviation.

the initial and modified models are presented in Table 3. Our initial structural equation model showed suboptimal fit. Based on Amos's modification indices and theoretical considerations, we added a covariance between the error terms of the physical and role functions, as both domains are often impaired simultaneously by chemoradiotherapy and share measurement overlap. No other modifications were made. The revised model showed acceptable fit ($\chi^2/\text{df} = 2.095$, root mean square of approximate error = 0.072, Goodness-of-Fit Index = 0.967, adjusted Goodness-of-Fit Index = 0.920, Normed Fit Index = 0.979, Incremental Fit Index = 0.989, Tucker–Lewis Index = 0.979, Comparative Fit Index = 0.989) (Table 3). Figure 1 presents the mediated chain effect model of stigma with quality of life. To determine whether there was a substantial mediating effect of stigma on quality of life, 5,000 samples were drawn repeatedly using a bootstrap approach. The confidence interval was set at 95%. According to the results, psychological resilience and benefit findings exerted an obvious mediating effect of stigma on quality of life among lung cancer cases with chemoradiotherapy, as shown in Table 4.

4. Discussion

4.1. Current status analysis of stigma, psychological resilience, level of benefit finding, and quality of life among lung cancer patients receiving chemoradiotherapy

Based on these results, the stigma score among those receiving chemoradiotherapy for lung cancer was 60.45 ± 15.49 points, consistent with Ren *et al.*³⁸ and above the medium level, indicating that patients with chemoradiotherapy for lung cancer generally had stigma. The reasons may be as follows. Firstly, every patient in this study has received chemoradiotherapy or radiation therapy, which means that the majority of them have abnormal changes in their appearance, such as skin pigmentation or hair loss, which make it easy for others to discuss, reject, or even isolate them. This can lead to self-esteem setbacks and inner shame, and the financial strain of treatment on the patient's family can exacerbate their stigma.³⁹ Secondly, a number of studies have shown⁴⁰ that smoking represents a major lung cancer high-risk factor; most patients who have ever smoked will feel ashamed and

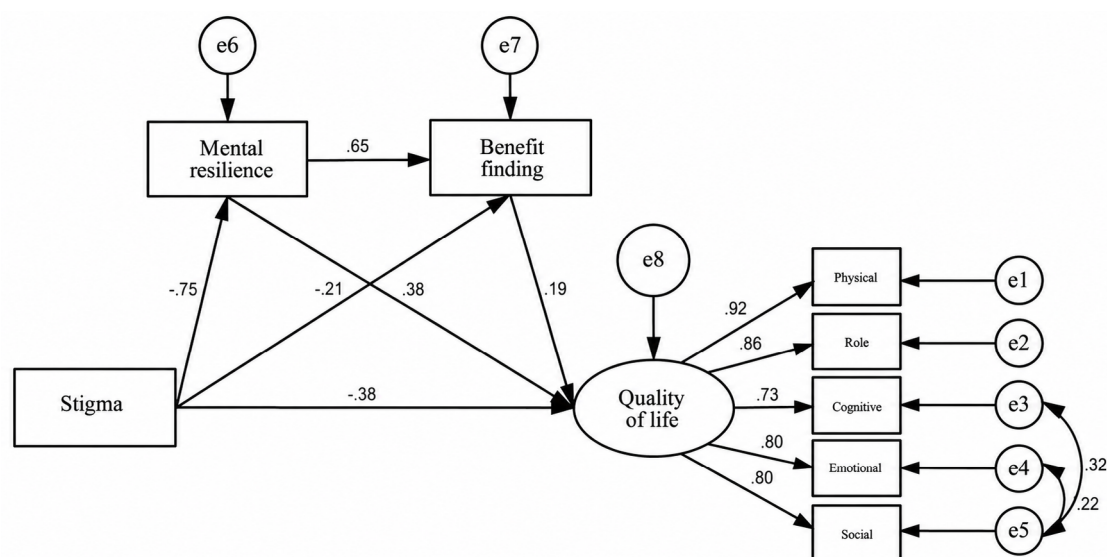


Figure 1. Model diagram of chain mediation effect

Table 3. Test results of the fitness of the initial model and the modified model

Fitting index	χ^2/df	RMSEA	GFI	AGFI	NFI	IFI	TLI	CFI
Adaptation standard	<3.00	<0.08	>0.90	>0.90	>0.90	>0.90	>0.90	>0.90
Initial model	3.485	0.108	0.935	0.862	0.960	0.971	0.952	0.971
Modified model	2.095	0.072	0.967	0.920	0.979	0.989	0.979	0.989

Abbreviations: AGFI: Adjusted Goodness-of-Fit Index; CFI: Comparative Fit Index; GFI: Goodness-of-Fit Index; IFI: Incremental Fit Index; NFI: Normed Fit Index; RMSEA: Root Mean Square Error of Approximation; TLI: Tucker-Lewis Index.

Table 4. Mediating effect test between stigma and quality of life in patients with lung cancer chemoradiotherapy

Path	Standardized indirect effect sizes	Standard error	95% CI	Effect size (%)
Path 1	$(-0.75) \times 0.38 = -0.285$	0.059	-0.404--0.174	35.86%
Path 2	$(-0.21) \times 0.19 = -0.040$	0.024	-0.096--0.002	4.99%
Path 3	$(-0.75) \times 0.65 \times 0.19 = -0.093$	0.041	-0.178--0.015	11.64%
Indirect effect	-0.418	0.06	-0.539--0.306	52.52%
Direct effect	-0.381	0.08	-0.534--0.219	47.62%
Total effect	-0.799	0.038	-0.867--0.720	100%

Notes: Path 1: Stigma → psychological resilience → quality of life; Path 2: Stigma → benefit finding → quality of life; Path 3: Stigma → resilience → benefit finding → quality of life. Bootstrap sample size = 5,000. Bias-corrected percentile method. All indirect paths significant at $p < 0.05$.

self-blame for their smoking behavior. In addition, China's smoking cessation propaganda mainly focuses on the harm of smoking to their own health and the health of others, resulting in widespread public bias against smokers and a sense of stigma for lung cancer patients. Furthermore, studies have indicated³⁸ that men ≥ 44 years old usually have a large proportion of smoking history, while in this study, men ≥ 46 years old accounted for a large proportion of 69.8% and 90.2%, respectively. Therefore, lung cancer

patients undergoing chemoradiotherapy in this study had a high level of stigma.

In this study, the psychological resilience level of patients was lower than that reported in patients with thyroid cancer¹⁷ and cervical cancer²¹. This may be explained by the more aggressive nature and poorer prognosis associated with lung cancer, which places a greater psychological burden on patients and diminishes

their resilience. Furthermore, the study of Wang *et al.*²⁰ revealed that early-stage lung cancer was insidious, and the disease was diagnosed in its medium or late stages in most of these patients. Patients were more likely to have negative emotions due to severe diagnosis outcomes, intricate treatment plans, and significant financial burdens.

In addition, the benefit-finding score of lung cancer patients with chemoradiotherapy was at a low level of 63.46 ± 16.81 points, conforming to that reported by Chen *et al.*⁴¹ but was lower than the results of Lassmann *et al.*⁴². This finding may be explained by the relatively low educational attainment of the study population, with only 7.0% of participants having completed a college degree or higher. According to research by Xu *et al.*⁴³, patients with less education had lower benefit-finding scores and were less able to learn about illnesses and health issues. As a result, they were unable to develop self-care skills and make an early psychological adjustment. Highly educated individuals can typically develop greater disease cognition through education and other means, easing the suffering caused by the disease's progression and ultimately accelerating recovery and patients' sense of empowerment to conquer it. In addition, the lower the educational background and the lower the income, the greater the economic burden caused by the disease, which leads to increased psychological burden for patients and decreased benefit finding.

Our scores in the functional domain of lung cancer patients' quality of life after chemoradiotherapy were close to those reported by Niu *et al.*⁴⁴ and Song *et al.*⁴⁵, but lower than the norm, indicating that lung cancer patients receiving chemoradiotherapy have generally low quality of life. This is because chemoradiotherapy is a commonly used and effective means for clinical treatment of lung cancer and disease control of patients, but its treatment methods can cause obvious adverse reactions. It is easy to cause great physical and mental damage to patients. In addition, patients have the inherent cognition that "tumor = terminal disease," and most patients are affected by negative emotions like anxiety, depression, and fear, which are associated with poorer treatment and recovery and are linked to lower quality of life.⁴⁶

4.2. Effect of stigma on quality of life among lung cancer patients receiving chemoradiotherapy

Our results reveal a significant negative association of stigma with psychological resilience, benefit finding, and quality of life among lung cancer patients undergoing chemoradiotherapy. This indicates that increased levels of stigma are related to decreased psychological resilience and benefit finding levels, and consequently to lower quality

of life. The above results align with previous research findings.^{14,21,23,25-27}

Moreover, the study demonstrates that stigma is directly correlated with lung cancer patients' quality of life after chemoradiotherapy. Additionally, stigma is indirectly associated with quality of life via the mediation of psychological resilience and benefit finding. Three pathways of mediating effects are identified: (i) the isolated mediation of psychological resilience; (ii) the isolated mediation of benefit finding; and (iii) the chain mediation involving psychological resilience as well as benefit finding.

4.3. Direct correlation of stigma of lung cancer cases with their quality of life

Stigma represents a prevalent negative psychological experience among lung cancer patients. According to our results, 54.88% of lung cancer patients exhibited stigma levels surpassing the medium threshold. Moreover, the study underscored that stigma had a significant, direct negative association with the quality of life of lung cancer patients undergoing chemoradiotherapy. This suggests a direct relationship between stigma and unfavorable quality of life among such patients. Previous research⁴⁷ has highlighted the high recurrence rate of lung cancer, ranging from 30% to 55%, coupled with prolonged treatment durations. Furthermore, chemoradiotherapy inflicts damage on normal body cells, precipitating numerous adverse reactions. Additionally, the disruption of the delicate balance between disease management and family life significantly impacts patients, fostering feelings of stigmatization.⁴⁸ However, experiencing "shame due to illness" is remarkably associated with patients' physical and mental well-being. Without timely psychological counseling and intervention, patients may exhibit avoidance and self-isolation behaviors, ultimately leading to social communication dysfunction. In turn, this exacerbates the psychological burden on patients and increases the likelihood of adverse physiological and psychological outcomes, thereby decreasing their quality of life. Additionally, findings from a cross-sectional study have demonstrated a strong correlation between stigma and quality of life.⁴⁹ Therefore, it is imperative to address the stigma of lung cancer cases undergoing chemoradiotherapy. Timely measures should be implemented to reduce patients' stigma levels associated with their quality of life.

4.4. The mediating role of psychological resilience between stigma and quality of life

As indicated by our findings, stigma is adversely associated with lung cancer patients' quality of life through psychological resilience. Specifically, higher stigma levels are

related to lower psychological resilience levels and reduced quality of life. Disease stigma represents the stress response characterized by a negative psychological state triggered by an individual's illness. It primarily arises from social discrimination related to the disease, leading to feelings of shame in the patient, which in turn is associated with poorer mood, decreased treatment adherence, and reduced overall well-being. Ultimately, disease stigma is associated with patients' recovery and quality of life.⁵⁰ Psychological resilience, as an internal protective mechanism in the body, plays an important role in mitigating the adverse effects of various factors. It enables patients to better adapt to their illness, maintain their physical and mental well-being, and ultimately reduce the stigma associated with their condition. Cheng *et al.*⁵¹ suggested that stigma was negatively related to psychological resilience. According to their results, patients with high psychological resilience tended to experience lower stigma, indicating that robust psychological resilience is an effective means of preventing and alleviating stigma. Furthermore, individuals with varying levels of psychological resilience exhibit differences in their ability to manage negative emotions and communicate effectively with others. Patients with high psychological resilience demonstrate enhanced emotional regulation skills, facilitating smoother communication and fostering a supportive environment conducive to disease treatment and recovery. This enhanced communication ability is ultimately associated with superior quality of life. Given these findings, medical professionals must address the stigma faced by lung cancer patients and prioritize the identification and support of patients with low psychological resilience. By leveraging psychological resilience as a cornerstone, personalized interventions can be implemented early to potentially improve patients' quality of life, provided that more longitudinal studies confirm causality.

4.5. The mediating role of benefit finding in the association between stigma and quality of life among lung cancer patients receiving chemoradiotherapy

Our findings suggest that stigma is associated with lung cancer patients' quality of life after undergoing chemoradiotherapy through benefit finding. In traditional Chinese beliefs, cancer is often regarded as an "unlucky" ailment, and there exists a cultural tendency of keeping personal struggles private ("dirty linen should not be aired in public"). Consequently, many patients feel hesitant to openly confront and discuss their illness. Furthermore, during cancer treatment, a significant number of patients struggle to effectively manage the psychological stress associated with their condition. This imbalance in self-

psychological adjustment frequently gives rise to negative emotions and facilitates the development of stigma. Such stigma is strongly associated with disruptions to patients' lives and professional endeavors and is correlated with a reduced ability to derive benefits from their experiences. Moreover, in accordance with the theory of the Imagined World, major adverse life events, such as cancer, can disrupt individuals' fundamental assumptions about themselves and the world around them. This disruption often precipitates a stress-induced state devoid of perceived benefits.⁵² However, the level of patient benefit discovered was strongly correlated with quality of life. As demonstrated by Chang *et al.*⁵³, after patients discovered low benefit levels, they acquired less disease-related knowledge. This lack of understanding exacerbates patients' fear of the disease, thereby increasing the occurrence of adverse reactions and complications while diminishing their quality of life. Both stigma and benefit-finding levels can be enhanced through measures such as positive mindset restructuring and cognitive-behavioral information support. Therefore, according to the psychological characteristics of those undergoing lung cancer chemoradiotherapy, medical staff are able to develop targeted intervention strategies to effectively reduce patient stigma, enhance benefit-finding levels, and ultimately improve their quality of life. Therefore, strategies that enhance self-esteem and resilience, rather than those focused solely on reducing internalized stigma, may be positively associated with quality of life in lung cancer patients.

4.6. Chain mediating roles of psychological resilience and benefit finding in the relationship between stigma and quality of life

In addition to confirming that psychological resilience and benefit finding play mediating roles in the relationship between stigma and quality of life, respectively, the current work also introduces another indirect mechanism by which stigma influences quality of life through a chain mediation model. In fact, our results not only help further elucidate the mechanisms that influence the relationship among stigma, psychological resilience, benefit finding, and quality of life, but also offer a novel perspective on enhancing quality of life. This may arouse the attention of health departments and healthcare professionals. This mechanism operates in the sequence of stigma, psychological resilience, benefit finding, and quality of life. Notably, the stress process model refers to the "process" by which a person's physiological and psychological responses to stress unfold, involving intermediary factors such as coping style, social support, and cognitive appraisal. This theory can explain the chain mediation of this study: patients with lung cancer can show stigma after experiencing the impact of

stressful events, and their psychological resilience and benefit findings can be regarded as individual cognitive evaluation factors, while their quality of life serves as the stress response outcome. Gao *et al.*⁵⁴ demonstrated that prolonged exposure to stigma, the negative psychological event, may diminish patients' resolve, capacity, and courage to confront both disease management and daily life challenges. Psychological resilience is positively correlated with more adaptive physiological regulation and enhanced coping strategies in response to stressful experiences, and these factors, in turn, are associated with lower levels of stigma. Additionally, Folkman *et al.*⁵⁵ assert that individuals with robust psychological resilience often adopt proactive strategies centered on finding meaning, such as cultivating happiness and reinforcing faith, which facilitates the perception of positive emotions. Essentially, heightened psychological resilience can facilitate the identification of benefits amid patients' illness experiences. Studies indicate that the adverse emotional effects induced by chemoradiotherapy in lung cancer patients can disrupt neuroregulatory function and lead to physiological and pathological alterations, including lipid metabolism disorders, elevated blood pressure, and excessive catecholamine secretion. These changes exacerbate physical symptoms and greatly affect their quality of life.⁵⁶ The discovery of benefits serves as a crucial psychological asset in confronting and navigating through stressful circumstances. It constitutes a positive motivational intention and behavior, encouraging patients to prioritize positive changes, comprehend the significance of adherence to treatment protocols, and thereby enhance their quality of life. Hence, healthcare professionals must diligently monitor and promptly assess the mental well-being of lung cancer patients undergoing chemoradiotherapy across various stages of their illness. In clinical settings, to reduce patients' psychological burden, medical and health professionals should provide psychological counseling for these patients in a timely manner. Our research findings suggest the need for intervention programs to enhance lung cancer patients' psychological quality of life by improving their resilience and benefit finding. Two ways can be utilized to achieve this: firstly, carry out activities to promote personal resources to better adapt to therapies for lung cancer; and secondly, encourage people with lung cancer to apply coping strategies that are suitable for their specific disorders. For this reason, interventions below should be further implemented are worth further implementation:

- (i) Psychological resilience training: Intervention programs targeting psychological resilience should be provided for lung cancer patients receiving chemoradiotherapy and radiotherapy. Cognitive-

behavioral therapy assists patients in identifying and changing negative thought patterns, thus enhancing their ability to cope with stress. Additionally, mindfulness-based interventions assist patients in improving their capability to control emotions, lower anxiety and depression symptoms, and enhance psychological resilience.⁵⁷

- (ii) Alleviate stigmatization: To promote effective stigmatization management in patients, healthcare professionals may provide psychological support services to alleviate stigmatization. For instance, psychological support group meetings can be routinely organized for personal experience sharing among invited patients, offering emotional support, helping them recognize stigma, and helping them free themselves from social stigma.
- (iii) Strengthening social support: The social support network is important for the quality of life of cancer patients. Healthcare professionals must assist patients in establishing a positive support system consisting of family, friends, and community resources. For instance, patient support groups are established to foster interaction among patients. By improving their social support, it is possible to help gain additional emotional support throughout treatment, reduce self-perceived burdens, and improve quality of life.

The above-mentioned intervention measures are beneficial for patients' emotional health and provide a practical framework for healthcare professionals to guide clinical practice. In addition to psychosocial care, continued advances in diagnostic and therapeutic technologies may also enhance overall treatment and outcomes in lung cancer cases.

4.7. Strengths and limitations

The present work investigated the stigma, psychological resilience, benefit finding, and quality of life across lung cancer cases who developed chronic conditions, emphasizing that it is valuable to improve psychological resilience and implement efficient interventions for improving their quality of life. These results lay a certain theoretical foundation for clinical doctors and caregivers.

Given our cross-sectional design, we could not draw causal inferences about the detected variables. First, participants were recruited from a tertiary hospital in Shanxi Province using convenience sampling, which may have limited the representativeness and generalizability of our findings. Meanwhile, important clinical and psychological factors, like anxiety, mental pain, and psychosomatic syndrome, were not systematically assessed in this work and must be incorporated in later studies.^{58,59} Although the present study examined the overall

associations in the sample, potential differences across demographic and clinical subgroups, such as age and sex, were not explored. Future studies should perform stratified analyses or multivariable adjusted models to better assess subgroup heterogeneity. Consequently, subsequent longitudinal studies must address these problems and explore their potential mechanisms in depth. In addition, even though self-report is widely used in the literature, the data collection approach is associated with inherent drawbacks, such as high subjectivity and bias in the data. More studies must incorporate multiple data collection approaches to cross-check and obtain accurate, objective data.¹⁸ Additionally, subsequent studies may consider expanding sample sizes to include additional regions to increase service breadth and applicability, and expanding the research area by examining specific setting factors using a multi-level model.⁶⁰ Medical staff must not only provide professional services to hospitalized patients but also specialized services to outpatient patients and those receiving treatment in rehabilitation clinics. Improving the assessment of patients with lung cancer and implementing planned interventions can enhance their quality of life.

5. Conclusion

This cross-sectional study demonstrates a significant negative association between stigma and quality of life in lung cancer patients undergoing chemoradiotherapy. Furthermore, psychological resilience and benefit finding were found to play a chain mediating role in this relationship. These findings suggest that healthcare professionals should be attentive to patients' perceived stigma and consider assessing their psychological resilience and benefit finding. However, due to the cross-sectional design, causal inferences cannot be established. Future multicenter longitudinal studies are warranted to confirm these associations and clarify the precise mechanisms. Furthermore, the sample was collected from a single top-tier hospital, which may limit the generalizability of the results. Further studies are warranted to validate our findings through multi-center, large-sample, and longitudinal studies.

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Conflict of interest

The authors declare no competing interests.

Author contribution

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Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Shanxi Bethune Hospital of China (No. LYLL-2025-002/PJ19) and conducted in accordance with the Declaration of Helsinki. All methods were performed in accordance with the recommended guidelines and regulations. The purpose and significance of the study were explained to the participants, and only those who agreed to participate were interviewed after written informed consent was obtained. Informed consent was obtained from all individual participants included in the study.

Consent for publication

The authors affirm that human research participants provided informed consent for publication of the manuscript.

Availability of data

The raw data supporting the conclusions of this article are available from the authors on reasonable request.

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