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Research Article

Path Analysis of Influencing Factors for Financial Toxicity in Patients With Lung Cancer

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Background: The impact of financial toxicity is extensive and far-reaching, even affecting the prognosis of patients with lung cancer. While the influence of sociodemographic factors on financial toxicity in patients with lung cancer has been identified, the exploration of the impact of psychosocial factors remains insufficient.
Aims: This study aims to explore the influencing factors and their pathways of financial toxicity in patients with lung cancer.
Methods: This was a cross-sectional study that utilized a convenience sampling method to select hospitalized patients with lung cancer as research population from a tertiary hospital in Sichuan Province between May and November 2023. Investigations were conducted using a general information questionnaire, Comprehensive Scores for Financial Toxicity, Social Support Rating Scale, and General Self-Efficacy Scale. Data analysis was performed using descriptive analysis, Mann–Whitney *U* test, Kruskal–Wallis H test, Spearman correlation analysis, stepwise linear regression analysis, and path analysis.
Results: The influencing factors of financial toxicity in patients with lung cancer include age, family income, commercial insurance coverage, social support, and self-efficacy. Furthermore, family income and social support have indirect effects on financial toxicity, while self-efficacy mediates the relationship between social support and financial toxicity.
Conclusion: The financial toxicity experienced by patients with lung cancer should be taken seriously. In clinical practice, healthcare professionals should promptly assess the level of financial toxicity in patients with lung cancer and implement personalized and diversified intervention measures to address it.

Keywords: financial toxicity; influencing factors; lung cancer; self-efficacy; social support

1. Introduction

Lung cancer emerged as the cancer with the highest global incidence and mortality rates in 2022 [1], with China recording 773,300 lung cancer–related deaths that year—the leading cause of cancer mortality nationwide [2]. The prevention and control of lung cancer face daunting challenges, compounded by its substantial disease burden. While advancements in medical science have introduced emerging treatment modalities such as targeted therapy, immunotherapy, and gene therapy alongside conventional approaches such as surgery, chemotherapy, and radiotherapy, these innovations have brought survival hope to patients yet concomitantly driven up treatment costs. Lung cancer imposes the heaviest economic burden in China, accounting for 15% of total cancer-related expenditures [3]. Between 2013 and 2016, the average hospitalization cost per lung cancer patient in China reached 15,669.53 yuan, with out-of-pocket expenses averaging 4744.43 yuan. Annually, direct medical costs per lung cancer patient amounted to 69.56% of the national per capita GDP [4]. Although the 2024 National Reimbursement Drug List (NRDL) incorporated 12 new anti–lung cancer medications, numerous therapies remain excluded from medical insurance coverage. Beyond direct

costs, indirect medical expenses for lung cancer patients are equally concerning. In China, indirect medical costs associated with advanced non–small-cell lung cancer average USD 1413 per patient [5]. Catastrophic health expenditure occurs in 78.1% of lung cancer–affected households [6], underscoring the profound economic strain on patients and their families.

The multifaceted economic challenges faced by lung cancer patients also engender significant intangible economic burdens, most notably the emergence of negative psychological states. Patients from low-income backgrounds or those struggling to afford treatment exhibit heightened risks of anxiety and depression [7]. A strong correlation exists between low socioeconomic status and diminished quality of life among lung cancer patients [8]. Compared to survivors of other cancers, lung cancer patients demonstrate the highest 5-year postdiagnosis bankruptcy rate [9]. Even among lung cancer survivors, unemployment rates rise and wage reductions persist relative to healthy populations [10]. Critically, economic pressures may manifest as treatment nonadherence—20% of cancer patients opt for subtherapeutic drug dosages, 7% forgo surgeries, 9% decline diagnostic tests, and 4% skip scheduled clinic appointments [11]. Such nonadherence often portends poorer clinical outcomes, underscoring the profound interplay between financial toxicity (FT) and patient prognosis in lung cancer care.

Cancer patients endure substantial financial burdens, accompanied by negative consequences such as diminished quality of life, psychosocial distress, and reduced or discontinued treatment. In recent years, this issue has garnered extensive attention and in-depth research from scholars globally. To better characterize the impact of treatment-related financial expenditures on patients, Zafar [11] introduced the concept of FT. Zafar defined FT as the harmful personal financial burden experienced by patients undergoing cancer treatment [12]. This encompasses both objective economic burdens and subjective financial distress, specifically referring to the high out-of-pocket expenses associated with cancer treatment, as well as the accompanying decline in patients' quality of life and well-being, reduced quality of treatment and care, and even increased nonadherence to treatment, all of which negatively impact the prognosis [11]. Existing studies on FT and its influencing factors in lung cancer patients have primarily focused on sociodemographic factors, disease-related factors, and treatment-related factors [13–18]. Building on this foundation, this study further investigates the role of psychosocial factors and delineates the pathways and effect sizes linking FT to its determinants. The findings aim to identify lung cancer patients at high risk of FT, inform the development of targeted interventions, and promote effective coping strategies and psychosocial rehabilitation for patients and their families.

1.1. Theoretical Basis. This study is based on the buffering hypothesis of social support [19] and self-efficacy theory [20]. Social support, as a stress buffer, operates through individuals' internal cognitive systems via two key mechanisms. First, perceived social support enhances an individual's self-perceived coping capacity, thereby reducing their appraisal of stressor severity. Yeung [21] posits that breast cancer survivors may facilitate post-traumatic growth by reducing perceived stress through received social support. Second, social support directly buffers the relationship between subjective stress perception and its negative impacts by providing problem-solving strategies. Luo et al. [22] argue that social support strategies such as public assistance programs and information sharing can effectively alleviate the financial burden on cancer patients. The development of self-efficacy is informed by four primary sources: direct accomplishments, vicarious experiences, verbal persuasion, and physiological and emotional states. Self-efficacy subsequently influences behavioral outcomes by modifying cognitive processes, behavioral patterns, and emotional responses.

For lung cancer patients confronting stressors (cancer-related financial expenses), coping mechanisms are not only associated with objective factors such as sociodemographic characteristics and disease/treatment parameters but are also crucially depended on patients' subjective feelings of self-coping (self-efficacy). Social support can influence the level of self-efficacy in the form of vicarious experience and verbal persuasion, thereby affecting their subjective financial distress. When cancer patients possess higher levels of self-efficacy, they demonstrate greater confidence in managing cancer-related financial challenges and exhibit a more proactive approach to problem-solving [23]. Furthermore, social support may directly mitigate objective economic burdens through practical strategies (e.g., financial assistance), consequently reducing the severity of FT (Figure 1).

2. Methods

2.1. Design. This is a descriptive cross-sectional study.

2.2. Study Setting and Sampling. Convenience sampling method was used. Patients with lung cancer who were hospitalized in the thoracic oncology ward of a tertiary hospital in Chengdu, Sichuan Province, China, between May 2023 and November 2023 were selected as the study population. Inclusion criteria include the following: (1) patients with lung cancer confirmed by histopathological diagnosis, (2) patients aged ≥ 18 years, (3) who are conscious, mentally clear, and possess basic communication and literacy skills, and (4) who provided informed consent and voluntarily agreed to participate. Exclusion criteria include the following: (1) patients with other concurrent malignancies and (2) patients unaware of their own medical condition.

The data were collected through an offline survey. The disease-related items were filled in by the researchers after reviewing the patients' medical records, and the researchers provided explanations using standardized instructions when the patients were filling out the survey.

2.3. Measurements

2.3.1. General Information Questionnaire. Researchers developed a general information questionnaire for patients by integrating the previous literature and consulting experts in

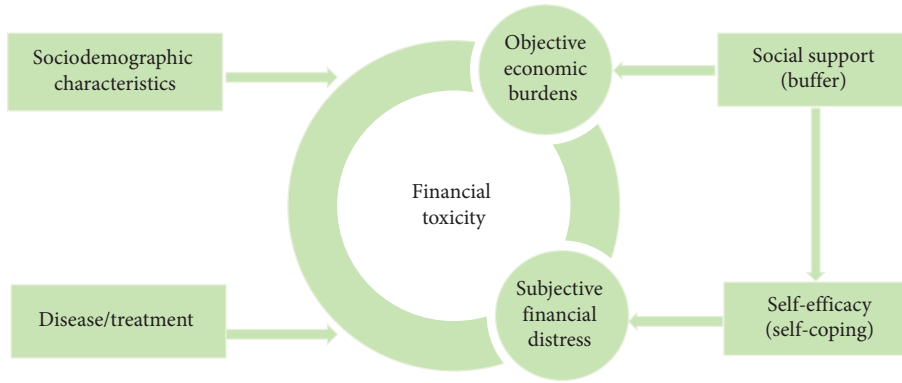

Figure 1: Theoretical model of factors influencing financial toxicity among lung cancer patients.

the fields of oncology and nursing. The general information includes sociodemographic data such as gender, age, marital status, and place of residence, and disease and treatment-related information including clinical stage, pathological type, and whether the tumor has metastasized. Patients provided their own sociodemographic characteristics, while researchers filled in the patients' disease information based on their medical records.

2.3.2. Comprehensive Scores for Financial Toxicity (COST). COST was originally developed by De Souza et al. [24]. In this study, we used the Chinese version of COST, revised and adapted by Chinese scholar Yu [25]. The Chinese version retains the number of dimensions and items from the original scale. This scale was an 11-item scale consisting of the following three subscales: financial expenditure, financial resources, and financial effect. It employs a 5-point Likert scale, where scores range from 0–4 representing "*not at all*" to "*very much*," respectively. The total score ranges from 0–44, with lower scores indicating higher levels of FT. A total score ≤ 22 is considered as high FT, whereas scores above this threshold are considered low FT. Cronbach's α for the Chinese version of the COST is 0.889, with test–retest reliability ranging from 0.77 to 0.98, and content validity at 0.820.

2.3.3. Social Support Rating Scale (SSRS). SSRS was developed by Chinese scholar Xiao [26] and consists of three dimensions: objective support, subjective support, and utilization of social support, with a total of 10 items. The total score of the scale ranges from 12 to 66 points. A total score of less than 22 points indicates a low level of social support, 22 to 44 points indicates a moderate level, and 45 points or above indicates a high level. A higher score indicates a greater degree of social support received by the individual. Cronbach's α coefficient of the scale is between 0.89 and 0.94, indicating good reliability.

2.3.4. General Self-Efficacy Scale (GSES). The Chinese version of GSES was developed by Schwarzer and Zhang [27]. This scale is a unidimensional 10-item instrument that employs a 4-point rating Likert scale, with scores of 1–4 representing *not at all true*, *somewhat true*, *mostly true*, and *completely true*, respectively. The total score ranges from 10 to 40, with higher scores indicating higher levels of self-efficacy. Cronbach's α for the Chinese version of the GSES is 0.87, demonstrating good reliability.

2.4. Statistical Analysis. IBM SPSS 26.0 and AMOS 26.0 were used for data analysis. Descriptive statistics were used for general data. The Kolmogorov–Smirnov test revealed that FT scores were non-normally distributed. Measurement data were reported as median and interquartile range (IQR), and count data were expressed as the frequency (n) and percentage (%). Univariate analyses employed the Mann–Whitney U test and Kruskal–Wallis H test for categorical variables, while quantitative data underwent the Spearman correlation analysis. Variables demonstrating statistical significance in univariate analyses were incorporated into a multiple stepwise regression model, with the COST score of lung cancer patients serving as the dependent variable, to identify key determinants of FT. Structural equation modeling (SEM) was subsequently applied to dissect the pathways through which multifaceted factors influenced FT. Statistical significance was defined as $p < 0.05$.

2.5. Ethics Approval and Consent to Participate. This study was approved by the Biomedical Ethics Committee of West China Hospital, Sichuan University (No. 453-2023). Written informed consent was obtained from all study participants.

3. Results

3.1. Characteristics of the Study Population. Final analysis included 273 lung cancer patients. Statistical analysis demonstrated that total FT scores in lung cancer patients were significantly associated with age, residence location, education level, family income, occupation, medical insurance type, cross-regional medical care status, commercial insurance coverage, disease-related employment changes, clinical stage, presence of metastasis, comorbidities, chemotherapy administration, and out-of-pocket medication expenses ($p < 0.05$). No significant correlations were

identified between total FT scores and gender, marital status, ethnicity, or other factors ($p > 0.05$) (Table 1).

3.2. Correlation Between Social Support, Self-Efficacy, and FT. The study findings indicate that higher levels of social support and self-efficacy are associated with decreased FT among lung cancer patients ($p < 0.05$). Specifically, the correlation between the social support and FT was stronger ($r = 0.441$, $p < 0.001$) (Table 2).

3.3. Factors Associated With FT in Patients With Lung Cancer. The factors with statistical significance in a univariate analysis, along with social support and self-efficacy, were included as independent variables, and FT was treated as the dependent variable in a multiple stepwise linear regression analysis. Collinearity tests for independent variables showed that the variance inflation factors (VIF) for all variables were < 2, indicating no significant multicollinearity among the independent variables. Regression analysis results demonstrated that age, family income, commercial insurance coverage, social support, and self-efficacy were ultimately included in the regression equation. The regression model test was statistically significant ($F = 36.279$, $p < 0.001$), with all variables explaining 47.0% of the total variance in FT among lung cancer patients (Table 3).

3.4. Path Analysis of Factors Influencing FT in Patients With Lung Cancer. Based on the results of multiple stepwise linear regression and domain expertise, this study constructed a theoretical model using age, family income, and commercial insurance coverage as exogenous variables, and social support, self-efficacy, and FT as endogenous variables (Figure 2). Due to non-normal distribution of the data, the Bollen–Stine bootstrap was employed for correction, with 2000 bootstrap resamples generated to ensure robust parameter estimation. This approach yielded a well-fitting path model (Table 4).

The most significant factor influencing FT in patients with lung cancer is family income, with a total effect of 0.530, while commercial insurance coverage demonstrates the smallest impact, showing a total effect of −0.151. Age, family income, commercial insurance coverage, social support, and self-efficacy all exert direct effects on FT. Additionally, household income, commercial insurance coverage, and social support exhibit indirect effects on FT, with effect values of 0.125, −0.020, and 0.085, respectively (Tables 5 and 6).

4. Discussion

The findings of this study revealed that the median COST score among patients with lung cancer was 19.00 (12.00, 25.00), with 65.9% of patients experiencing high FT. These results align with a survey by Liu et al. [18] on Chinese lung cancer patients, which reported a similar median COST score of 20.00. However, compared to international studies by Hazell et al. [15] and Friedes et al. [16], Chinese lung cancer patients demonstrated higher levels of FT. Firstly, although China has implemented universal medical insurance since 1998 and achieved significant progress, studies have shown that out-of-pocket expenses account for more than 25% of total medical expenditures for Chinese patients [28]. This indicates a lack of public awareness of medical insurance, and the government should enhance efforts to promote medical insurance awareness and improve public health literacy. It also suggests that medical insurance coverage is limited. With the innovation of therapies such as immunotherapy and targeted therapy, the treatment costs for lung cancer patients have increased. Additionally, China has a relatively high proportion of rural population. According to the results of the 7th National Population Census, as of 2020, the rural population accounted for 36.11% of the total population, exceeding one-third of the national population [29]. Due to socioeconomic disadvantages in rural areas, farmers have limited sources of income and relatively low disposable income. When facing serious illnesses such as lung cancer, their indirect expenses such as transportation and accommodation increase [30]. They may also tend to choose lower-cost treatment options and conservative treatment approaches, which may lead to poor outcomes. Therefore, it is essential to implement precise medical security measures for severely impoverished populations, continuously promote critical illness insurance and medical assistance for the poor, and improve the medical safety net policy. In addition, to fundamentally reduce the level of FT for patients, especially rural patients, it is crucial to prioritize lung cancer prevention, early diagnosis, and early treatment efforts.

Young patients are more vulnerable to the hazards of FT. The analysis of the reasons may be that the cancer diagnosis of young patients occurs during their academic pursuits, and academic qualifications are potential factors influencing future income and employment, and such patients are usually not covered by medical insurance [31]. For young and middle-aged patients who are already employed, repeated hospital visits may force them to take sick leave, switch to part-time work, or even resign, resulting in a loss of income and even loss of medical insurance, thereby increasing the level of FT. At the same time, young patients often have more household financial expenses. As the "backbone" of the family, their financial expenses may not only be for themselves but also for their children and the elderly. For the sake of their family, they may choose to forgo treatment [32]. Compared to young patients, prime-aged patients may have fully developed their careers, with stable income sources or multiple economic sources; elderly patients, on the other hand, usually have more savings and stable income (such as pensions). At the same time, elderly patients rarely bear the obligation of supporting their families, and their financial expenses are also lower, so their level of FT is relatively low. In addition, young patients are more likely to accept emerging treatment methods or drugs, which often mean more treatment expenses [33]. Therefore, in clinical practice, medical staff should pay attention to identify the level of FT in young lung cancer patients and also focus on their psychological state to reduce the harm of subjective financial hardship.

Table 1: Univariate analysis of patients' characteristics and financial toxicity score ($n = 273$).

Variate	Groups	n (%)	COST M (IQR)	U/H	p
Gender	Male	187 (68.5)	19.00 (13.00)	−0.494[a]	0.621
	Female	86 (31.5)	18.00 (15.25)		
Age	< 40	25 (9.2)	16.00 (14.00)	10.848[b]	**0.028**
	40–49	37 (13.6)	18.00 (13.00)		
	50–59	87 (31.9)	18.00 (15.00)		
	60–69	77 (28.2)	20.00 (10.50)		
	≥ 70	47 (17.2)	22.00 (14.00)		
Marital status	Unmarried	8 (2.9)	24.50 (17.25)	2.026[b]	0.567
	Married	230 (84.2)	19.00 (12.00)		
	Divorced	14 (5.1)	18.00 (14.00)		
	Widowed	21 (7.7)	22.00 (15.00)		
Residence	Rural area	59 (21.6)	12.00 (11.00)	34.417[b]	< **0.001**
	Township	32 (11.7)	16.00 (13.75)		
	Urban area	182 (66.7)	21.00 (11.00)		
Ethnicity	Han Chinese	258 (94.5)	19.00 (13.25)	−0.422[a]	0.673
	Ethnic minorities	15 (5.5)	19.00 (12.00)		
Education level	Junior high school or below	136 (49.8)	15.00 (12.00)	36.632[b]	< **0.001**
	Senior high school/vocational school	56 (20.5)	21.00 (16.00)		
	Junior college	30 (11.0)	23.50 (9.00)		
	Bachelor's degree or above	51 (18.7)	23.00 (11.00)		
Family income (yuan¥)/M/P	< 2000	65 (23.8)	10.00 (10.00)	76.706[b]	< **0.001**
	2000–5000	120 (44.0)	18.00 (12.00)		
	> 5000	88 (32.2)	24.00 (10.75)		
Occupation	Civil servant	19 (7.0)	25.00 (9.00)	39.091[b]	< **0.001**
	Farmer	68 (24.9)	13.50 (10.75)		
	Military personnel	2 (0.7)	14.00 (/)		
	Technical personnel	35 (12.8)	23.00 (11.00)		
	Self-employed	19 (7.0)	17.00 (15.00)		
	Office worker	47 (17.2)	16.00 (15.00)		
	Others	83 (30.4)	20.00 (12.00)		
Medical insurance type	Urban employee basic medical insurance	144 (53.7)	23.00 (10.50)	49.493[b]	< **0.001**
	Urban resident basic medical insurance	46 (16.8)	17.50 (11.50)		
	New rural cooperative medical scheme	75 (27.5)	12.00 (11.00)		
	Self-pay	8 (2.9)	8.00 (13.50)		
Treated outside insured area	Yes	188 (68.9)	17.50 (13.00)	4.210[a]	< **0.001**
	No	85 (31.1)	22.00 (10.50)		
Commercial insurance coverage	Yes	68 (24.9)	23.00 (10.00)	−3.251[a]	**0.001**
	No	205 (5.1)	18.00 (12.00)		
Employment status changed due to illness	Yes	139 (50.9)	17.00 (13.00)	4.712[a]	< **0.001**
	No	134 (49.1)	21.00 (12.25)		
Smoking history	Yes	179 (65.6)	20.00 (13.00)	−0.992[a]	0.321
	No	94 (34.4)	18.00 (12.75)		
Family history of lung cancer	Yes	62 (22.7)	17.50 (15.25)	0.657[a]	0.511
	No	211 (77.3)	19.00 (12.00)		
Cancer stage	Stage I	24 (8.8)	20.00 (9.50)	9.781[b]	**0.021**
	Stage II	28 (10.3)	22.00 (8.75)		
	Stage III	56 (20.5)	20.50 (10.25)		
	Stage IV	165 (60.4)	17.00 (14.50)		
Pathological type	Adenocarcinoma	119 (43.6)	19.00 (12.00)	3.789[b]	0.435
	Small-cell carcinoma	79 (28.9)	18.00 (17.00)		
	Squamous cell carcinoma	46 (16.8)	19.00 (11.00)		
	Large-cell carcinoma	12 (4.4)	23.50 (14.50)		
	Mixed type	17 (6.2)	19.00 (12.00)		
Metastasis	Yes	223 (81.7)	18.00 (15.00)	2.297[a]	**0.022**
	No	50 (18.3)	21.50 (8.50)		

Table 1: Continued.

Variate	Groups	*n* (%)	COST M (IQR)	U/H	*p*
Duration of illness (year)	< 1	163 (59.7)	19.00 (14.00)	1.171[b]	0.557
	1–2	49 (17.9)	18.00 (11.50)		
	> 2	61 (22.3)	21.00 (15.00)		
Presence of comorbidities	Yes	97 (35.5)	21.00 (13.00)	−2.827[a]	**0.005**
	No	176 (64.5)	18.00 (14.00)		
Surgery	Yes	91 (33.3)	20.00 (13.00)	−1.520[a]	0.129
	No	182 (66.7)	18.00 (13.25)		
Chemotherapy	Yes	237 (86.8)	19.00 (14.00)	−2.063[a]	**0.039**
	No	36 (13.2)	18.00 (9.50)		
Radiotherapy	Yes	177 (64.8)	19.00 (14.50)	0.512[a]	0.609
	No	96 (35.2)	19.00 (11.75)		
Targeted therapy	Yes	108 (39.6)	19.00 (12.00)	0.409[a]	0.683
	No	165 (60.4)	19.00 (13.50)		
Immunotherapy	Yes	139 (50.9)	20.00 (12.00)	−1.285[a]	0.199
	No	134 (49.1)	18.00 (14.00)		
Types of treatment received (count)	0	22 (8.0)	14.50 (12.25)	6.708[b]	0.152
	1	25 (9.2)	19.00 (14.50)		
	2	53 (19.4)	17.00 (14.00)		
	3	95 (34.8)	19.00 (16.00)		
	≥ 4	78 (28.6)	20.00 (13.00)		
Out-of-pocket drug use	Yes	224 (82.1)	20.00 (14.00)	−2.798[a]	**0.005**
	No	49 (17.9)	16.00 (11.00)		

Note: COST: Comprehensive Scores for Financial Toxicity. All p values < 0.05 (statistically significant) are highlighted in bold.
[a]Mann–Whitney U test.
[b]Kruskal–Wallis H test.

Table 2: Correlation between social support, self-efficacy, and financial toxicity ($n = 273$).

Variate	COST	
	r	*p*
SSRS	0.441	< 0.001
GSES	0.415	< 0.001

Note: COST: Comprehensive Scores for Financial Toxicity.
Abbreviations: GSES, General Self-Efficacy Scale; SSRS, Social Support Rating Scale.

Our research has shown that the family income is a factor influencing the FT of lung cancer patients, and this finding is consistent with the results of other lung cancer–related studies [34, 35]. The lower the average monthly income per capita of a family, the higher the level of FT is. The average monthly income per capita of a family is directly related to the patient's objective financial burden. In situations where disposable income is low, patients may, out of consideration for their own survival or that of their family, resort to negative measures such as changing their lifestyle, reducing their quality of life, or even reducing or forgoing treatment [12]. Nearly 30% of lung cancer families choose to mortgage their homes or take out loans to pay for treatment costs, and the borrowing costs further exacerbate the FT of lung cancer patients [13]. At the same time, due to the characteristics of lung cancer, radical surgical resection is the preferred treatment for early-stage NSCLC to enhance local control and long-term survival. In advanced stages, patients may develop distant metastases, leading to local and systemic symptoms as well as paraneoplastic syndromes, which increase the burden of symptoms on patients. Delays or abandonment of treatment lead to a heavier symptom burden, making it more difficult for lung cancer patients to return to work, and the level of FT becomes increasingly higher, creating a vicious cycle. In the face of low-income patients, although medical staff cannot directly improve their economic situation, they can encourage them to participate in cost conversations and make joint decisions on treatment and care plans in order to achieve higher quality and more valuable care and treatment.

Previous studies have shown that, compared with lung cancer patients who have purchased commercial insurance, uninsured patients have a higher probability of disease progression to an advanced stage and a lower probability of receiving surgical treatment [36]. Furthermore, an increase in the out-of-pocket rate is associated with an increase in the specific mortality rate [37], which indicates the impact of insurance status on diagnosis, treatment, and prognosis. This is because patients with broader insurance coverage are more inclined to receive more, higher-value, and higher-quality medical services, both in terms of payment ability and subjective willingness. Additionally, China has a large rural population, and compared with the urban population, their disposable income and education level are relatively lower. Therefore, they lack the awareness and practical conditions for purchasing commercial insurance, while urban residents have stronger purchasing power and will

Table 3: Multiple stepwise regression analysis of financial toxicity in patients with lung cancer ($n = 273$).

Variate	*B*	SB	*t*	*p*	95% CI
Constant	−13.117	—	−3.403	0.001	−20.712~-5.522
Age	2.692	0.315	6.499	< 0.001	1.876~3.509
Family income (yuan (¥))/M/P (< 2000)					
2000~5000	5.493	0.280	4.623	< 0.001	3.152~7.834
> 5000	10.381	0.484	7.418	< 0.001	7.624~13.138
Commercial insurance coverage (yes)	−3.399	−0.153	−3.111	0.002	−5.551~−1.246
Social support	0.266	0.210	3.679	< 0.001	0.123~0.408
Self-efficacy	0.366	0.198	3.580	< 0.001	0.165~0.568

Note: $R^2 = 0.483$, adjusted $R^2 = 0.470$, $F = 36.279$, and $p < 0.001$.

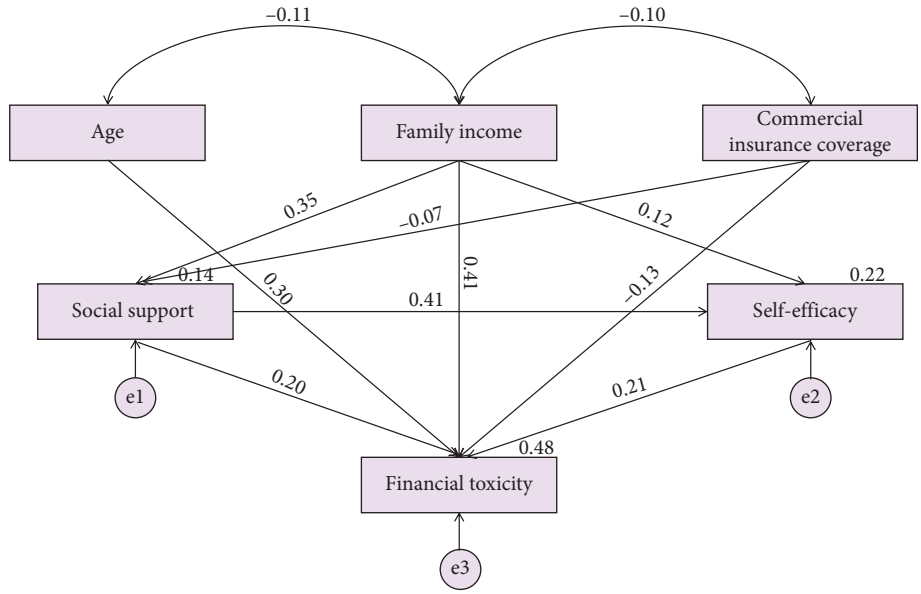

Figure 2: The path analysis diagram of financial toxicity in patients with lung cancer, with the presented values being standardized coefficients.

Table 4: Goodness of fit indices for the model.

Indices	χ^2/df	*p*	AGFI	NFI	IFI	CFI	RMSEA
Evaluation criterion	< 3	> 0.05	> 0.9	> 0.9	> 0.9	> 0.9	< 0.08
Model fit value	2.228	0.057	0.941	0.940	0.965	0.962	0.069

Note: df, degree of freedom; NF, normed fit index.
Abbreviations: AGFI, adjusted goodness of fit index; CFI, comparative fit index; IFI, incremental fit index; RMSEA, root mean square error of approximation.

Table 5: Effect analysis of related influencing factors for financial toxicity in patients with lung cancer ($n = 273$).

Variate	Direct effect	Indirect effect	Total effect
Age	0.296	—	0.296
Family income	0.405	0.125	0.530
Commercial insurance coverage	−0.131	−0.020	−0.151
Social support	0.198	0.085	0.282
Self-efficacy	0.207	—	0.207

pursue higher levels of health security needs [38]. Finally, most cancer insurance products are fixed-sum payment, meaning that once the insured is diagnosed with the disease, the insurance company will pay the insured a lump sum of the insurance amount agreed upon in the contract in advance. However, some patients who have not purchased

Table 6: The standardized regression coefficients for all study paths.

Pathways	Coefficients	95% CI		p
		Lower	Upper	
Family income ⟶ social support	0.354	0.242	0.451	< 0.001
Commercial insurance coverage ⟶ social support	−0.074	−0.191	0.035	0.185
Social support ⟶ self-efficacy	0.406	−0.298	0.506	< 0.001
Family income ⟶ self-efficacy	0.124	0.001	0.242	0.047
Social support ⟶ financial toxicity	0.198	0.096	0.291	< 0.001
Commercial insurance coverage ⟶ financial toxicity	−0.131	−0.227	−0.044	0.002
Age ⟶ financial toxicity	0.296	0.220	0.383	< 0.001
Family income ⟶ financial toxicity	0.405	0.312	0.493	< 0.001
Self-efficacy ⟶ financial toxicity	0.207	0.103	0.305	< 0.001

commercial insurance may choose to pay out-of-pocket due to being unable to wait for the complicated referral process, thereby increasing their treatment expenses. To sum up, the state should continue to deepen the implementation of medical security system reform, expand medical insurance coverage and scope of protection, actively explore critical illness medical insurance that suits national conditions and promote its implementation, and enrich supplementary medical insurance.

The greater the social support received by cancer patients, the lower their FT levels, which is consistent with findings from multiple studies [4, 39]. According to Cohen, social support refers to the psychological assistance and material resources provided by social networks to help individuals effectively manage stress [40], corresponding to the concept of FT that encompasses both objective economic burdens and subjective financial distress. Social support can facilitate stress reappraisal, enabling individuals to develop adaptive coping mechanisms and reduce negative impacts, such as gaining problem-solving strategies from others [19]. By offering material, informational, and emotional support to lung cancer patients, social support directly alleviates objective economic pressures and improves negative emotions and subjective financial distress. The most common source of social support is family, with family members providing financial assistance, caregiving, and emotional support to lung cancer patients. Friends, colleagues, and other social networks also contribute to social support. Additionally, medical professionals and peer patients can offer support in areas such as disease management, insurance reimbursement, and other medical and financial information. Furthermore, social support can prevent the onset of negative impacts by altering individuals' perceptions of stressful events [19]. When individuals believe they have sufficient social support, they feel capable of coping, so potential stressors are not perceived as threatening. Lung cancer patients who perceive social support can develop optimistic subjective evaluations of medical expenses by modifying their internal cognitive appraisals, thereby improving subjective financial distress. As one of the social support sources for lung cancer patients, clinical medical staff should not only assess patients' social support levels but also actively provide emotional and informational support. They should also assist in mobilizing patients' social support networks to enhance social support levels and mitigate the harmful effects of FT.

Bandura's self-efficacy theory posits that an individual's behavior is influenced not only by the outcomes of their actions but also by their efficacy expectations and outcome expectations [20]. Self-efficacy can affect behavioral outcomes through thought patterns, behavioral changes, emotional changes, and behavioral persistence. Lung cancer patients with high levels of self-efficacy may resist the harmful effects of FT by adjusting their own obstructive thinking and negative emotions, reducing lifestyles that are detrimental to quality of life, and minimizing noncompliant behaviors. At the same time, self-efficacy serves as an effective source for individuals to actively cope with negative influences, enhancing patients' ability to take initiative in dealing with their illness and their sense of control over their life circumstances [41]. When lung cancer patients face disease-related financial crises, higher levels of self-efficacy can improve their coping abilities and resilience to setbacks, allowing them to actively address the crisis and reduce the negative impacts of subjective financial distress. Therefore, medical professionals should prioritize attention to lung cancer patients with low self-efficacy levels. By employing positive verbal encouragement, citing positive examples from other patients, providing high-quality care, and alleviating symptom burdens, medical professionals can improve patients' physiological states, enhance their self-efficacy, and mitigate the subjective negative impacts of FT.

Path analysis results suggest that family income is the most significant influencing factor on FT. Besides having a direct impact on FT, it can also exert influence through the mediating effects of social support and self-efficacy. Individuals with low economic income have relatively limited access to social resources [42], as income is often linked to occupation, education, and social connections. This means that high-income patients can obtain more objective support in terms of finances and information. At the same time, economic income is an important factor influencing self-efficacy [43]. A better economic status gives patients both objective and subjective confidence and coping abilities regarding medical expenses, resulting in higher levels of self-efficacy. Interventions targeting this factor mainly focus on increasing income and improving the cost-effectiveness of treatment expenditures. Methods of increasing income, such as patients returning to work and paid sick leave, are closely related to the social security system. Therefore, the state should ensure fairness and support for cancer patients in terms of employment, leave, and salary through relevant

policies, legislation, and welfare benefits. At the same time, regarding treatment costs, medical professionals should actively engage in cost conversations with patients and encourage them to become the dominant decision-makers in medical expenses after fully understanding medical information. Strategies for such dialog may include shared decision-making between doctors and patients, providing accurate insurance coverage information, offering personalized out-of-pocket expense information, and assistance from clinicians and health systems in reducing indirect costs [44]. Additionally, providing financial navigation services in medical institutions can effectively reduce patients' economic burdens. These services include insurance optimization, debt management, financial screening, and cost consultation [45].

Self-efficacy acts as a mediator between social support and FT. One of the effects of social support, functioning as a buffer, is to enable individuals to underestimate the harm caused by stressful situations. By enhancing self-perceived coping capabilities, it reduces the severity assessment of stressful events. This effect is typically achieved through altering individuals' internal cognitive processes [19]. Specifically, the more adequate social support lung cancer patients receive, the more positively they evaluate economic pressures, the higher their self-efficacy levels become, and the stronger their coping abilities and resilience emerge, thereby fostering greater confidence and motivation to face such challenges. According to self-efficacy theory, performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal are the four components of self-efficacy [20]. Among these, vicarious experience and verbal persuasion can influence self-efficacy levels through social support. For lung cancer patients, obtaining medical and financial information support from healthcare providers, as well as emotional and practical support from peers and family members, are all pathways to improving self-efficacy. Furthermore, self-efficacy serves as an important internal protective factor for individuals, while social support acts as an external protective factor. By leveraging external protective factors to bolster internal ones, individuals can effectively navigate adversities. In conclusion, healthcare providers should prioritize the mediating role of self-efficacy, actively build social support systems and expand social networks for lung cancer patients, monitor their psychological and cognitive states, fully enhance their self-efficacy, and help them adopt positive coping strategies to mitigate the impacts of FT.

5. Limitations

First, this study employed a cross-sectional design rather than a longitudinal approach, which limits the ability to capture changes in FT levels and their influencing factors throughout the disease trajectory and treatment process of lung cancer patients. Second, the use of convenience sampling in this study may introduce selection bias, potentially restricting the generalizability of the findings to broader populations.

6. Conclusions

The level of FT is significantly higher among lung cancer patients. Our research reveals that younger patients, those with lower family incomes, and individuals without commercial insurance are more vulnerable to FT. Beyond these sociodemographic factors, it is also correlated with psychosocial factors such as social support and self-efficacy. This underscores the need for personalized, multifaceted approaches to managing FT in patients with lung cancer. Future research could focus on policy advocacy, health education for lung cancer prevention and treatment, development of assistive tools, and multidisciplinary decision-making support systems to alleviate this burden.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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