Research Square

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The Mediating Effect of Social Support in the Relationship between Fear of Progression and Perceived Stress among Lymphoma Patients

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Abstract

Purpose

To investigate the level of perceived stress and its associated factors among young-and-middle-aged Chinese patients with lymphoma, and to explore the mediating role of social support in the relationship between fear of progression (FOP) and perceived stress.

Methods

This cross-sectional study enrolled 260 young-and-middle-aged patients with lymphoma from two tertiary hospitals in China. Data were collected using the Perceived Social Support Scale (PSSS), the Fear of Progression Questionnaire-Short Form (FoP-Q-SF), and the Perceived Stress Scale (PSS). SPSS 26.0 was adopted for statistical analyses, and Hayes' PROCESS macro (Model 4) was applied to test the mediating effect.

Results

The mean PSS score of participants was 30.00 ± 6.93. Gender, age, marital status, educational level and monthly family income were significant sociodemographic influencing factors for perceived stress. Perceived stress was negatively correlated with social support and positively correlated with FOP. Social support exerted a mediating effect on the association between FOP and perceived stress, explaining 57.49% of the total effect.

Conclusions

Young-and-middle-aged Chinese patients with lymphoma experience relatively high levels of perceived stress. Social support mediates the link between fear of progression and perceived stress. Clinical caregivers may mitigate patients’ perceived stress by relieving fear of progression and strengthening their social support resources. These findings provide evidence for future research on psychological distress among lymphoma survivors and inform the development of targeted psychosocial intervention programs for this patient population.

Trial registration

Not applicable

1. Introduction

Lymphoma is a malignant tumor originating from the lymphohematopoietic system[1]. According to GLOBOCAN 2022 data, there were approximately 631,419 new cases and 173,276 new deaths from lymphoma globally[2]. Clinical manifestations of this disease include systemic symptoms such as painless lymph node enlargement, fever, night sweats, and weight loss[3]. Additionally, adverse effects

such as chemotherapy-induced myelosuppression, mucositis, and immune-related cardiac toxicity from immunotherapy lead to persistent fatigue, recurrent infections, and organ dysfunction in over 62% of patients, severely impairing their daily activity capacity[4]. The high prevalence of multidimensional symptoms, combined with multiple factors including treatment uncertainty, exposes lymphoma patients to significant perceived stress[5]. It is worth mentioning that, unlike patients of other age groups, young and middle-aged patients with lymphoma often face multiple pressures, including career development, family responsibilities, and disease coping, making their mental health status a critical concern[6].

Perceived stress refers to an individual's subjective experience of tension arising from cognitive appraisal of threats in internal or external environments, with its core lying in the individual's imbalanced judgment of the threat posed by events and their own coping ability[7]. Studies investigating the current status of perceived stress among patients with lymphoma have been relatively rare. However, some scholars have focused on perceived stress in patients with other tumor types. For example, multiple studies have investigated perceived stress levels in breast cancer patients across multiple regions[8], and there are also studies examining perceived stress levels in groups such as lung cancer patients[9], gynecologic cancer patients[10], pediatric leukemia patients, and the general cancer population[11]. Studies have shown that the level of perceived stress in patients with malignant tumors is significantly higher than that in the general population[11]. Many studies have also explored the factors influencing this high perceived stress, though most have focused solely on patients' socio-demographic characteristics and disease-specific features. A systematic review by Tan et al. synthesized and analyzed 41 studies from 15 countries, finding that the sources of perceived stress in cancer patients are multi-dimensional, related not only to patients' own conditions but also to external environmental support[5]. This state of high stress can exacerbate disease progression through multiple mechanisms, thereby exerting adverse effects on patients. For young and middle-aged patients, overlapping stressors such as occupational competition, family financial burdens, and child-rearing responsibilities mean that high perceived stress severely impairs their quality of life[12]. Therefore, special attention should be paid to the influence of various factors on the pressure perception of young and middle-aged patients.

Fear of progression (FOP) refers to an individual's persistent concern about disease deterioration, recurrence, or the occurrence of complications[13]. A systematic review analyzing 46 studies from 13 countries revealed that among 9,311 cancer patients, 59% experienced moderate FOP, and 19% had severe FOP[14]. Additionally, the prevalence of FOP was significantly higher in young and middle-aged patients than in older patients, suggesting that this psychological issue is more prominent in younger populations[15]. Although mild FOP may help remind patients to maintain healthy lifestyle habits, high levels of FOP can interfere with treatment decisions and hinder patients' recovery and treatment outcomes[13]. Previous studies have shown a significant positive correlation between FOP and perceived stress levels[16]. However, it remains unclear whether FOP indirectly influences perceived stress through social support.

Social support is a multidimensional systemic resource network comprising three types of functions: emotional care, instrumental assistance, and information sharing, which is provided through social relationship networks such as family, friends, and communities[17]. It exerts a buffering effect that alleviates stress and enhances psychological resilience, effectively improving stress responses[18]. Usta have demonstrated the importance of social support in cancer adaptation[19]. Studies have shown that higher levels of social support are associated with lower perceived stress[20]. Additionally, research has found that social support can mitigate psychosocial distress[21], suggesting its potential role as a buffer against FOP. Studies have confirmed that emotional support from core family members, as a natural emotional bond, significantly promotes patients' psychological adjustment and physical recovery[22]. Active coping strategies supported by social or family resources are crucial for patients to readapt to changes in their surrounding environment[23]. Bauer et al. noted that social support helps patients improve their mental health and strengthen their confidence in cooperating with treatment[24]. Therefore, it is necessary to investigate the role of social support in the perceived stress of young and middle-aged patients with lymphoma to help them reduce their fear of disease recurrence and psychological stress.

In summary, the factors influencing the Perceived stress levels of young and middle-aged patients with lymphoma are multi-dimensional. Current research primarily focuses on the direct effects of various factors on Perceived stress, while neglecting their indirect effects. Although previous studies have reported the pairwise relationships among FOP, perceived stress, and social support, the mediating role of social support between FOP and perceived stress has not been clearly investigated. Existing findings have indicated that social support may help cancer patients alleviate negative emotions (including fear) and psychological distress. Therefore, if social support mediates the relationship between FOP and perceived stress, it will provide critical interventional guidance for buffering the adverse effects of FOP on perceived stress. The purpose of this study is to investigate the current status and influencing factors of Perceived stress among young and middle-aged patients with lymphoma, and to validate the following three hypotheses among young and middle-aged patients with lymphoma in China: (1) There is a positive correlation between FOP levels and perceived stress levels; (2) There is a negative correlation between social support levels and perceived stress levels; (3) Social support mediates the association between FOP and perceived stress.

2. Methods

2.1 Design and participants

The cross-sectional study was conducted from September 2024 to February 2025. Using a convenience sampling method, young and middle-aged patients with lymphoma diagnosed and treated at two tertiary hospitals in Changsha and Tianjin were selected as research subjects. The inclusion criteria were as follows: (1) patients with a pathological diagnosis of lymphoma at any stage of disease; (2) patients who have been informed of their medical condition; (2) young and middle-aged patients aged 18 to 60 years; (3) patients with no cognitive impairment, capable of normal communication, and able to independently

complete questionnaires. The exclusion criteria were as follows: (1) patients with comorbid mental disorders; (2) patients with other malignant tumors; (3) patients with severe complications in the heart, brain, kidney, or lung; (4) patients unwilling to participate.

The Power Analysis and Sample Size Software (PASS) 2021 (NCSS, LCC, Kaysville, Utah, USA) was used for sample size calculation in this study (Formula: $N = [Z_{1-\alpha/2}\sigma/\delta]^2$). An additional 10%-20% of the sample size was required for mediation analysis to account for multiple testing and model complexity. Using the Bootstrap method, the base sample size was set to be ≥ 200 cases. With $\alpha = 0.05$, based on existing research results[11], the mean score and standard deviation (σ) of perceived stress in Chinese cancer patients were 34.83 ± 8.16. By setting the tolerable error (δ) to 0.2σ, the calculated required sample size was 240 cases.

2.2 Measures

2.2.1 Sociodemographic characteristics

Sociodemographic characteristics included the following variables: age, gender, educational background, marital status, parental status, duration since diagnosis, medical insurance status, and monthly household income.

2.2.2 Measurement of perceived stress

The Perceived Stress Scale (PSS) was used to assess the perceived stress levels of the study participants. Originally developed by Cohen et al. and validated for Chinese use by Chu Lijuan, this scale evaluates patients' stress experiences[25]. It comprised 14 items, with each item rated on a 5-point Likert scale (0="never", 1="rarely", 2="sometimes", 3= "often", 4= "most of the time"), resulting in a total score range of 0–56; higher total scores indicate greater perceived stress. The Cronbach's alpha coefficient for the total PSS was 0.895 in this study.

2.2.3 Measurement of the fear of progression

Fear of progression was measured by the 12-item short version of the Fear of Progression Questionnaire (FOPQ-SF)[26]. Each item was rated on a 5-point Likert scale ranging from 1 to 5, representing "never" to "very often". Higher scores indicate a higher fear of progression. Wu et al. translated it into the Chinese version and had a high internal consistency coefficient (Cronbach’s alpha = 0.883). In the current study, the Cronbach’s alpha for the total scale was 0.945.

2.2.4 Measurement of social support

The study chose the Multi-Dimensional Scale of Perceived Social Support (MSPSS), assessed using the 12-item version designed by Zimet et al[27]. The scale comprised three measurements: families and friends support, as well as significant others. The gross score of social support was used in the current sample. Participants rated each item on a 7-point Likert scale (1="very strongly disagree" to 7="very strongly agree"). A higher total score indicates better social support. The Chinese version of the scale

had been verified to have adequate reliability, and validity among cancer patients and Cronbach's alpha coefficient was 0.965 in our research.

2.3 Data collection

Convenience sampling was used in this study to select patients with lymphoma receiving treatment at two tertiary hospitals in Changsha and Tianjin for questionnaire surveys. Data were collected using an online questionnaire platform, Wenjuanxing. The introduction section of the questionnaire included three key components: an explanation of informed consent, a detailed description of the study, and a description of data privacy and confidentiality measures. During the implementation of the study, the collection of sample data was managed by two of the study's authors. Prior to formal data collection, these two investigators received standardized training. The primary objectives of the training were to thoroughly understand the study's purpose and master key considerations for accurate questionnaire distribution, ensuring the smooth progress of subsequent data collection and the validity of the data.

For sample recruitment, we first obtained verbal consent from hospital leaders. With their assistance, researchers added participants via WeChat (a popular Chinese messaging/social media app) and shared study recruitment posters in WeChat groups. These posters detailed study content, data privacy, and participation requirements. Interested participants scanned the QR code on the poster to contact researchers and express voluntary participation. Researchers then verified eligibility against predefined criteria. After confirming eligibility, researchers re-explained study details to obtain full informed consent. Eligible participants completed online questionnaires privately to ensure independence and accuracy. To minimize bias, strict rules were enforced: questionnaires could only be submitted via unique IP addresses, and all questions must be answered before submission, ensuring data completeness and validity.

After a series of rigorous implementation processes, by May 1, 2025, a total of 282 patients had completed the questionnaire designed for this study. This sample size met the study's predefined requirements, and based on this, the researchers closed the access link to the online questionnaire as planned, terminating questionnaire data collection.

2.4 Data analysis

All data were double-entered using EpiData 3.1, followed by data comparison and logical checks to ensure accuracy. After confirming no data entry errors, statistical analysis was performed using SPSS 25.0 software.

Categorical variables were described using frequency and percentage; continuous variables were described with mean ± standard deviation. The Shapiro-Wilk test was used to assess the normality of continuous data. Since the data did not follow a normal distribution, the rank sum test was used for univariate analysis to evaluate the associations between perceived stress and categorical variables in sociodemographic characteristics. Multiple linear regression analysis was conducted on significant variables from the univariate analysis to identify sociodemographic factors influencing perceived stress

and determine confounding covariates affecting the mediation model. Spearman correlation analysis was used to examine the relationships between social support, fear of progression, and perceived stress. Finally, the PROCESS V.3.5 Macro (Model 4) in SPSS was used to test the mediation model. Bootstrap samples (n = 5000) were applied, and the total scores of the social support, fear of progression, and perceived stress scales were standardized by subtracting the mean and dividing by the standard deviation. The 95% confidence intervals (CIs) were calculated; a non-zero CI indicated a significant mediation effect. A p-value < 0.05 was considered statistically significant.

2.5 Ethics statement

These procedures of this study were reviewed and approved by the Ethics Committee (Approval number: 2024-S618). The study process was conducted in accordance with ethical standards. Written informed consent for participation was obtained from each participant. Personal privacy was protected during data handling, and personal records were kept confidential.

3. Results

3.1 Sociodemographic characteristics

A total of 282 questionnaires were collected in this study, of which 260 were valid, with an effective response rate of 92.2%. Finally, 260 patients were enrolled in the study, with 121 males (46.5%) and 139 females (53.5%); patients aged 40–49 years accounted for the highest proportion at 46.2%; married marital status was most common (76.9%); the majority had children (82.7%); undergraduate education level showed the highest proportion at 53.5%; the duration since diagnosis was mainly 0–3 years, accounting for 86.2% in total; urban employee basic medical insurance (UEBMI) was the most prevalent (43.5%); and the highest proportion of patients (33.5%) had a family monthly income ranging from 3000 to ¥6000. As shown in Table 1, the summary descriptive statistics of these 260 patients are presented.

Table 1
Sociodemographic characteristics(n = 260)

Variables	Categories	n(%)
Gender	Male	121(46.5)
	Female	139(53.5)
Age	18–29	40(15.4)
	30–39	20(7.7)
	40–49	120(46.2)
	50–59	80(30.8)
Marital status	Unmarried	41(15.4)
	Married	198(76.9)
	Divorced or widowed	21(7.7)
Parental status	Absence of children	44(17.3)
	Presence of children	216(82.7)
Educational background	Junior college and below	80(30.8)
	Undergraduate	139(53.5)
	Postgraduate degree or above	41(15.8)
Duration since diagnosis	0–1 year	113(43.5)
	1–3 years	109(42.7)
	3–5 years	27(10.4)
	More than 5 years	11(3.5)
Medical insurance status	Urban Employee Basic Medical Insurance (UEBMI)	117(43.5)
	Urban and Rural Resident Basic Medical Insurance (URRBMI)	107(40.4)
	Commercial medical insurance	36(16.2)
Monthly household income	Less than ¥3,000	46(17.7)
	¥3000–6000	87(33.5)
	¥6000–9000	71(27.3)
	More than ¥9,000	56(21.5)

3.2 Univariable and multivariable analyses of the Sociodemographic characteristics associated with perceived stress

Univariable analysis was first performed, with non-parametric tests examining the associations between the total score of the Perceived Stress Scale (PSS) and sociodemographic characteristics. Statistically significant differences were observed in gender, age, marital status, parental status, educational background, duration since diagnosis, and average monthly household income ($P < 0.05$). Subsequently, stepwise multiple linear regression analysis was conducted, using the total PSS score as the dependent variable and sociodemographic variables with statistical significance from univariable analysis as independent variables. Gender, age, marital status, educational background, and average monthly household income were retained in the final model, explaining 43.1% of the variance in perceived stress. The results are summarized in Table 2.

Table 2
Univariable and multivariable analyses of the sociodemographic characteristics associated with perceived stress

Variables	Categories	P50(P25, P75)	Z/H	*P* (univariate)	*P* (multivariable)
Gender	Male	34.00(29.00,35.00)	-4.836	**<0.001**	**<0.001**
	Female	26.00(26.00,37.00)			
Age	18–29	32.00(26.00,38.00)	78.659	**<0.001**	**<0.001**
	30–39	32.00(32.00,32.00)			
	40–49	34.00(29.00,36.00)			
	50–59	26.00(14.75,32.00)			
Marital status	Unmarried	32.00(26.00,38.00)	23.617	**<0.001**	
	Married	32.50(27.00,35.00)			0.937
	Divorced or widowed	26.00(26.00,26.00)			**0.035**
Parental status	Absence of children	33.00(26.00,38.00)	-1.979	**0.048**	0.444
	Presence of children	32.00(26.00,35.00)			
Educational background	Junior college and below	27.00(26.00,32.00)	43.020	**<0.001**	**<0.001**
	Undergraduate	34.00(26.00,36.00)			
	Postgraduate degree or above	34.00(32.00,37.00)			
Duration since diagnosis	0–1 year	27.00(26.00,34.00)	29.316	**<0.001**	
	1–3 years	35.00(32.00,36.00)			
	3–5 years	27.00(26.00,34.00)			
	More than 5 years	32.00(21.50,36.00)			
Medical insurance status	Urban Employee Basic Medical Insurance (UEBMI)	32.00(26.00,36.00)	1.980	0.372	
	Urban and Rural Resident Basic Medical Insurance (URRBMI)	33.00(26.00,34.00)			

Variables	Categories	P50(P25, P75)	Z/H	*P* (univariate)	*P* (multivariable)
	Commercial medical insurance	32.50(26.75,36.00)			
Monthly household income	Less than 3,000 ¥	33.00(11.00,33.00)	11.579	**0.009**	**<0.001**
	3000–6000 ¥	34.00(26.00,37.00)			
	6000–9000 ¥	29.00(27.00,35.00)			
	More than 9,000 ¥	32.00(26.00,36.00)			

3.3 Correlation between social support, fear of progression and perceived stress

To investigate the presence, strength, and direction of correlations among social support, fear of progression, and perceived stress, Spearman correlation analysis was performed in this study. A statistically significant positive correlation was observed between perceived stress and fear of progression (r = 0.367, P < 0.001). A statistically significant negative correlation was found between social support and perceived stress (r=-0.753, P < 0.001), as well as between social support and fear of progression (r= -0.340, P < 0.001). The mean score of the Perceived Stress Scale (PSS) was 30.00 ± 6.93. The results are shown in Table 3.

Table 3
Correlation between social support, fear of progression and perceived stress

Variables	Mean ± SD	Perceived Stress	Fear of progression	Social support
Perceived Stress	30.00 ± 6.93	1		
Fear of progression	35.54 ± 9.11	0.367**	1	
Social support	52.62 ± 10.56	-0.753**	-0.340**	1
**P < 0.01				

3.4 Mediation effect of social support on fear of progression and perceived stress

To construct a hypothetical model with fear of progression as the independent variable, perceived stress as the dependent variable, and social support as the mediator, controlling for covariates, and using Model 4 in the PROCESS macro program of SPSS to test the mediation effect. The Bootstrap method was used to verify the mediating role of social support between fear of progression and perceived stress. The path coefficients among the three variables are shown in Fig. 1.

As presented in Table 4, the upper and lower bounds of the Bootstrap 95% confidence intervals for the indirect effect of fear of progression on perceived stress through social support did not include zero, indicating that fear of progression not only had a direct effect on perceived stress but also exerted an indirect effect through social support. The direct effect (0.088) and mediating effect (0.119) accounted for 42.51% and 57.49% of the total effect respectively.

Table 4
The results of the mediation analysis

Categories	Effect	Se	LLCI	ULCI	Effect size
Total effect	0.207	0.046	0.117	0.296	
Direct effect	0.088	0.037	0.015	0.160	42.51%
Indirect effect	0.119	0.024	0.074	0.169	57.49%
Note: SE = standard error; CI = confidence interval; LL = lower limit; UL = upper limit;CI = confidence interval.					

4. Discussion

The results of this study showed that the Perceived Stress of young and middle-aged patients with lymphoma was (30.00 ± 6.93), which was comparable to the scores (29.02 ± 3.42) reported in Lei et al.[28]. Additionally, our findings were significantly higher than those of Yalcin-Siedentopf et al.'s research on 503 general adults (22.27 ± 7.78 in females and 19.74 ± 6.48 in males)[29]. Possible explanations include that young and middle-aged lymphoma patients not only endure physical pain and psychological burdens from their disease but also face unique social role conflicts specific to their life stage[30]. During treatment, chemotherapy side effects, recurrence risks, and long-term survival anxiety continuously exacerbate psychological stress[31]. Meanwhile, occupational disruption, imbalanced family responsibilities, and discrepancies between social expectations and reality further intensify psychological load[32]. These findings suggest that the mental health issues of lymphoma patients require multi-dimensional (biological-psychological-social) interventions. The significant difference from the general population underscores that the patients experience pressure beyond general adaptability, highlighting the urgent necessity to alleviate their psychological burden and improve quality of life through comprehensive measures such as medical support and social role adjustment.

Meanwhile, this study also revealed that the perceived stress levels of young and middle-aged patients with lymphoma are primarily influenced by gender, age, marital status, educational background, and family monthly income. Female patients reported lower perceived stress levels than male patients, which may stem from differences in social role expectations and coping strategies[33]. Males are often constrained by the social norm of "emotional restraint", tending to internalize stress or adopt passive coping methods; in contrast, females are more adept at relieving stress through social support networks[34]. Compared with older patients, younger patients exhibited higher perceived stress levels,

possibly due to facing more practical stressors such as occupational disruption, family responsibilities, and interruption of fertility plans[6]. The perceived stress level of the divorced/widowed group was higher than that of the unmarried group, likely attributed to structural differences in social support systems. Marriage typically provides emotional connection, whereas divorced/widowed individuals, experiencing sudden loss of spousal support, may fall into isolation and reduced stress regulation capacity[23]. In contrast, although unmarried individuals lack spousal support, they may build alternative support systems through friends or family to buffer the impact of the disease[22]. Higher educational background was associated with higher perceived stress levels, potentially linked to cognitive characteristics and social expectations[5]. Their professional identity and sense of social contribution rely more on professional competence, so occupational disruption or reduced ability due to illness may trigger a stronger sense of self-worth crisis. Contrary to Longo et al.'s findings[35], higher family monthly income was associated with higher perceived stress levels in this study, which may be due to the relatively small sample size and dispersed sample population limiting generalizability. These findings suggest that clinical nursing can adopt stratified intervention strategies to alleviate psychological stress in lymphoma patients. For example, potential strategies might include gender-differentiated psychological support that provides emotional expression space for male patients and combining it with vocational rehabilitation programs to relieve financial pressure; and age-specific interventions by offering career planning counseling and fertility preservation guidance for younger patients.

Additionally, this study further explored the relationships between social support, fear of progression, and perceived stress in young and middle-aged patients with lymphoma. We found a positive correlation between fear of progression and perceived stress. The theory of uncertainty in illness and the cognitive-behavioral model of health anxiety emphasize that fear of recurrence or progression is a core mechanism underlying the stress state of cancer survivors. Hall et al.'s research indicates that a substantial proportion of stress in cancer survivors may be attributed to fear of progression triggered by physical symptoms[16]. The positive correlation between fear of progression and perceived stress can be explained by a triadic psychological-physiological-social mechanism[36]. As a chronic stressor, fear of progression continuously activates the stress response system, exacerbating subjective feelings of stress[37]; simultaneously, high perceived stress induces catastrophic thinking, further amplifying fear of the disease and creating a vicious cycle[7]. Moreover, elevated perceived stress enhances sympathetic nervous system activity, worsening physical symptoms, which may be interpreted by patients as signals of disease progression, thereby reversely reinforcing fear of progression[38]. Furthermore, young and middle-aged patients are more sensitive to threats of social role loss, such as occupational disruption and family responsibility rupture[12]. The co-occurrence of fear of progression and perceived stress collectively reflects their deep-seated anxiety about "unfinished life tasks." In summary, this association is not merely a co-occurrence of symptoms but a dynamically reinforcing stress cycle, highlighting the need for simultaneous intervention with cognitive restructuring and stress management. Additionally, the results indicate a negative correlation between social support and perceived stress. When cancer patients receive greater social support, they exhibit a higher quality of life and lower perceived stress[39].

In intimate relationships, patients' adaptation to the disease and family communication patterns significantly influence their ability to cope with the illness[22]. Therefore, medical staff and family caregivers must recognize the critical importance of providing social support to lymphoma patients.

Consistent with expectations, the study results indicated that social support exerts a partial mediating effect in the relationship between fear of progression and perceived stress among young and middle-aged patients with lymphoma. Higher levels of fear of progression may be mitigated by higher levels of social support, thereby reducing perceived stress. Social support (as a positive factor) weakens the negative impact of fear of progression (as a risk factor) on perceived stress[40]. This may be because when patients hold lower levels of fear regarding disease progression, they exhibit greater adaptability to physical functional changes and lifestyle adjustments[24]. Such psychological resilience enables individuals to more acutely identify social care resources. High-quality social interaction networks can effectively enhance individuals' psychological resilience by providing emotional comfort and informational support, thereby improving their emotional regulation capacity under treatment-induced stress[39]. This dynamic equilibrium mechanism helps maintain patients' perceived stress at a relatively stable level. Conversely, individuals with high fear of progression often fall into a state of cognitive dissonance, where their automatic thoughts tend to catastrophically interpret interpersonal relationships[13]. This phenomenon may trigger the projection effect in psychological defense mechanisms—patients project their own fear of the disease onto misinterpretations of others' attitudes, leading to a subjective experience of "being isolated." Under this vicious cycle, patients' perceived stress levels rise[16]. These findings suggest that relieving perceived stress in young and middle-aged lymphoma patients can be achieved by enhancing social support levels and reducing fear of the disease, ultimately improving their quality of life.

5. Strengths and limitations

In summary, this study provides a comprehensive understanding of the perceived stress status and its related factors among young and middle-aged patients with lymphoma. These findings offer a foundation for hospitals and nurses to reduce the perceived stress levels of this population and develop more effective interventions. However, this study also has limitations. First, due to funding and time constraints, the research was conducted in only two hospitals across two cities (north and south of China), which may have introduced regional bias. Second, as a cross-sectional study, it cannot establish causal inferences between variables. Third, psychological variables were primarily assessed using self-report tools, which may be susceptible to recall and response bias.

6. Conclusions

In conclusion, this study aimed to investigate the perceived stress status among young and middle-aged patients with lymphoma and examine the mediating mechanism of social support between fear of progression and perceived stress. Specifically, our findings revealed that the majority of young and

middle-aged patients with lymphoma exhibited high levels of perceived stress. Gender, age, marital status, educational background, and average monthly household income were identified as significant sociodemographic factors influencing their perceived stress levels. Additionally, fear of progression not only directly affected the perceived stress levels of young and middle-aged patients with lymphoma but also indirectly influenced perceived stress through social support. These findings indicate that high levels of perceived stress among young and middle-aged patients with lymphoma remain a significant concern. Therefore, relevant interventions should be implemented in clinical nursing practice to alleviate perceived stress levels in this population by enhancing social support and reducing fear of the disease, thereby improving their quality of life.

7. Relevance to Clinical Practice

This study have provided empirical guidance for psychosocial care in young and middle-aged lymphoma patients. We have found that patients experience high perceived stress, with fear of progression (FOP) directly exacerbating it and social support acting as a key mediating factor. For clinical practice, this means nurses can prioritize enhancing social support using approaches such as peer support groups or family counseling to mitigate the impact of FOP, thereby reducing psychological stress and improving quality of life. This offers feasible strategies for targeted mental health interventions.

Declarations

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Ethics approval : These procedures of this study were reviewed and approved by the Ethics Committee of the Third Xiangya Hospital of Central South University (Approval number: 2024-S618).

Trial registration: Not applicable

Consent: Informed consent was obtained from all individual participants included in the study . participants signed informed consent regarding publishing their data.

Competing interests: All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Statistical data-related statement: The authors affirm that the methods used in the data analyses are suitably applied to their data within the study design and context, and the statistical findings have been implemented and interpreted correctly.All authors agree to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the Journal.

Author Contribution

Yuxin Xing: Data curation,Formal analysis,Methodology,Writing-original draft□Tao Xiao: Conceptualization,Writing-original draft□Lu Li: Data curation, Formal analysis, Writing-original draft□Liling Mao: Data curation, Writing-original draft□Xinyi Su: Data curation, Writing-original draft.

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Data Availability

The Ungdata surveys that support the findings of this study are available from correspond author, but restrictions apply to the availability of these data, which were used under licence for the current study and so are not publicly available. The data are, however, available upon request and with the permission of correspond author.

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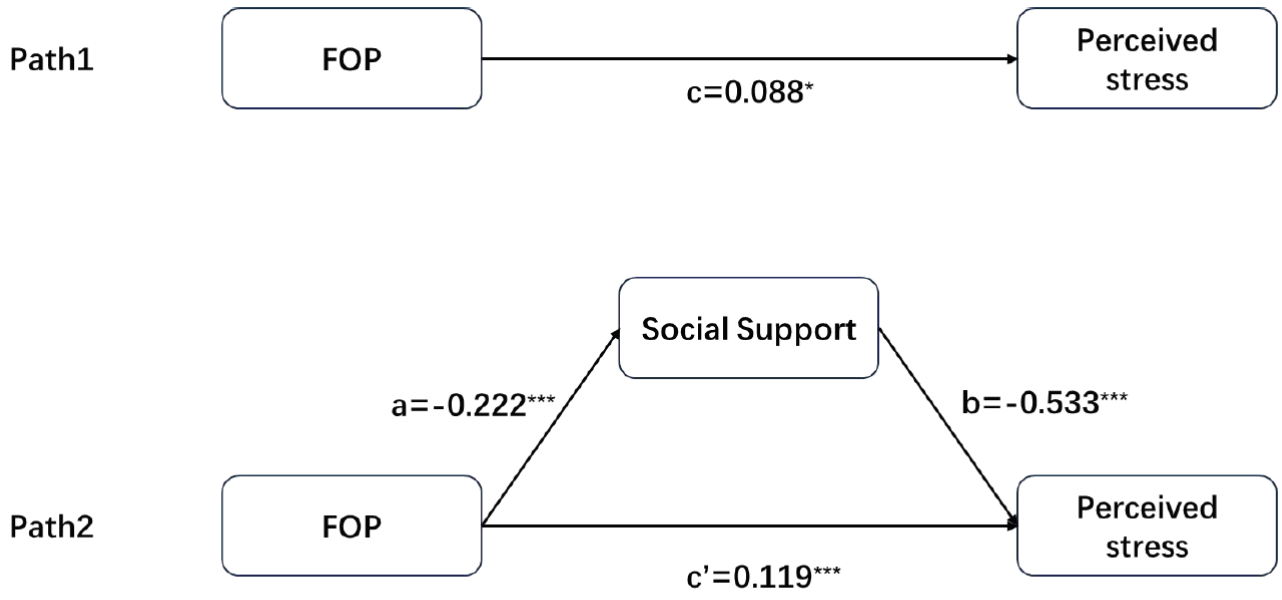
Figures



$*P < .05, ***P < .001;$

Figure 1

Mediating role path diagram of social support between fear of progression and perceived stress (*P < 0.05,***P < 0.001)