Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Social support and family resilience among hematopoietic stem cell transplant recipients: the mediating roles of family coping, communication, and psychological resilience

Simin TAN
The Third Xiangya Hospital of Central South University
Jingyu GAO
Peking University People's Hospital
Ya CHEN
Xiangya Hospital of Central South University
Lezhi LI
Central South University
Aidi ZHANG
Hebei University
Xiangjun YANG
xiangjunyang2024@163.com

Changsha Hospital For Maternal & child Health Care

Article

Keywords: Hematopoietic stem cell transplantation, Social support, Family resilience, Psychological resilience, Family communication, Family coping

Posted Date: August 10th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9722595/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Social resources influence the development of family resilience through individuals and families. This study aims to explore the effect of social support on family resilience in patients undergoing hematopoietic stem cell transplantation, as well as the possible mediating roles of family coping, family communication and psychological resilience in this relationship.

Methods

A cross-sectional survey was conducted among 268 patients with hematopoietic stem cell transplantation. Multiple assessment scales including social support, family resilience, family coping, family communication and psychological resilience were adopted. AMOS 24.0 was used to establish a structural equation model to explore the relationships among various variables.

Results

The results demonstrated that family coping, family communication, and psychological resilience exerted a significant indirect effect between social support and family resilience ($\beta = 0.476$, $p < 0.001$). Specifically, family coping ($\beta = 0.276$, $p < 0.001$) and family communication ($\beta = 0.095$, $p < 0.001$) independently mediated the relationship between the two variables. Moreover, family coping and psychological resilience played a notable sequential mediating role in the association between social support and family resilience ($\beta = 0.081$, $p < 0.001$). Similarly, family communication and psychological resilience also exhibited a significant sequential mediating effect on the correlation between social support and family resilience ($\beta = 0.022$, $p < 0.001$).

Conclusion

Social support was significantly correlated with family resilience in patients receiving hematopoietic stem cell transplantation. Furthermore, family coping, family communication and psychological resilience collectively exerted substantial indirect effects on this core association. Considering the limitation of the cross-sectional design, the present results merely reflect associations rather than causal links.

Clinical Trial Registration

Not applicable.

Introduction

Hematopoietic Stem Cell Transplantation (HSCT) is an important therapeutic approach for curing hematologic diseases or prolonging the survival of affected patients. It involves administering high-dose radiochemotherapy or other immunosuppressive conditioning regimens to eliminate tumor cells and abnormal clonal cells in the recipient, block the disease pathogenesis, and subsequently transplant autologous or allogeneic hematopoietic stem cells to enable the recipient to reconstruct normal hematopoietic and immune functions[1]. According to the data reported by the Chinese Bone Marrow Transplantation Registry Group[2], the number of cases receiving HSCT in China reached 21,714 in 2023, representing a 19.4% increase compared with 2022. Meanwhile, the symptoms during each treatment stage of HSCT are complex and diverse, with high requirements for nursing care during the treatment process and a long rehabilitation cycle after transplantation. Although the disability rate[3] and mortality rate[4] of transplanted patients have been continuously decreasing with the development of medical technology, as a high-risk therapeutic method, HSCT remains a great challenge for patients and their families.

Patients with hematological diseases receive treatment and rehabilitation in a special environment of long-term interpersonal and physical isolation. Well-maintained family function serves as a crucial guarantee for the smooth implementation of hematopoietic stem cell transplantation and subsequent rehabilitation of patients. Family resilience, also referred to as family recovery resilience or family toughness, is defined as the capacity to withstand and recover from adversity, as well as to achieve growth and acquire more resources from it[5]. Studies have shown that family resilience can not only provide a supportive environment for the treatment of cancer patients, alleviate their psychological distress[6] and symptom burden[7], but also play a vital role in promoting the positive adaptation of cancer patients' families to adversity[8]. Systematic reviews[9] have indicated that individual and family characteristics such as patients' psychological resilience, social support, family coping, and family communication are the major influencing factors of family resilience.

However, few existing studies have explored the action pathways of various influencing factors on family resilience, and the influencing mechanism between individual psychological resilience and family resilience remains unclear. The ABC-X model[10] is an important theoretical framework of family stress that describes how families adjust and adapt when confronted with stressor events. This model points out that when facing stressors, families mobilize internal and external family resources, including those at the individual, family, and social levels; the richer the resources, the stronger the resilience of families in responding to crises. Based on this, this study hypothesizes that family coping, family communication, and psychological resilience play mediating roles between social support and family resilience in patients undergoing hematopoietic stem cell transplantation.

Methods

Study design

This study adopted a cross-sectional design to examine the relationships among social support, family coping, family communication, psychological resilience and family resilience. From May 2025 to September

2025, continuous data collection was conducted in three large general hospitals in Hunan and Beijing, China. The present study was reported in accordance with the STROBE statement.

Setting and sample

This project was a multicenter survey. Research data were collected from three large medical institutions, including two general hospitals in Changsha, Hunan Province, and one general hospital in Beijing, China. The design aimed to expand sample representativeness and enhance the general applicability of the research findings.

A convenience sampling method was used to select patients who have completed hematopoietic stem cell transplantation in outpatient or inpatient settings as study participants. The inclusion criteria were as follows: aged over 18 years, having finished hematopoietic stem cell transplantation in the non-acute phase, with clear consciousness, and voluntary participation in the study.Patients with a history of mental illness or neoplastic disease, those experiencing post-transplant relapse or graft failure, or those who have undergone hematopoietic stem cell transplantation twice or more were excluded from this study.

Instruments

Demographic information

Demographic data included gender, age, employment status, residential location, marital status, educational level, family structure, disease diagnosis, duration since diagnosis, number of chemotherapy sessions, transplantation type, and time since transplantation.

Multidimensional Scale of Perceived Social Support

Social support was measured using the multidimensional scale of perceived social support. The scale was originally developed by Zimet et al[11]. and culturally adapted into Chinese by Jiang Qianjin et al[12]. It is used to evaluate individuals'perceived support from family members, friends and significant others. The scale consists of 3 dimensions with a total of 12 items, including family support, friend support, and other support. It adopts a 7-point Likert scoring system, ranging from "strongly disagree" to "strongly agree", with scores rated from 1 to 7. The total score ranges from 12 to 84. Higher scores indicate a higher level of perceived social support. In the present study, the Cronbach's α coefficient of this scale was 0.955.

Family Crisis Oriented Personal Evaluation Scales

Family coping was assessed using the Family Crisis-Oriented Personal Evaluation Scales. Developed by Hamilton I, McCubbin and other scholars[13], this scale was translated into the Chinese version by Wang et al[14]. It serves as an effective tool to evaluate the coping behaviors and strategies adopted by families when facing difficulties or crises. The scale consists of 6 dimensions with a total of 27 items, including acquiring relatives' support, acquiring friends' support, acquiring neighbors' or others' support, seeking

spiritual support, reframing, and passive appraisal. A 5-point Likert scoring method was adopted, with scores ranging from 1 to 5 corresponding to "strongly disagree" to "strongly agree". The total score ranges from 27 to 135 points. A higher score indicates that families adopt more coping strategies or use them more frequently. In this study, the Cronbach's α coefficient of the scale was 0.878.

Family Assessment Device-Communication Subscale

Family communication was measured using the Family Assessment Device-Communication Subscale. Developed by Epstein et al[10]. and translated into Chinese by Li Rongfeng et al[15]., This instrument is designed to assess the overall functional status of the family system. Only the Communication subscale was used in the present study. Items were rated on a 4-point Likert scale, with scores of 1 to 4 assigned from "Very much like my family" to "Not at all like my family". The total score ranged from 9 to 36, and higher scores reflected more unhealthy family communication behaviors. In this study, the Cronbach's α coefficient of the subscale was 0.656.

Connor-Davidson resilience scale

Psychological resilience was assessed by the 10-item Connor-Davidson Resilience Scale (CD-RISC-10). This brief scale was simplified by Campbell-Sills and Stein[16] on the basis of the original CD-RISC developed by Connor and Davidson[17], and its Chinese version was culturally adapted by Zhang Danmei et al[18]. It is used to evaluate and identify individual resilience traits. The scale consists of a single dimension with 10 items. All items are rated on a 4-point Likert scale, ranging from "strongly disagree" to "strongly agree", with corresponding scores of 1 to 4. The total score ranges from 4 to 40, and a higher score indicates stronger individual psychological resilience. In the present study, the Cronbach's α coefficient of this scale was 0.969.

Family Resilience Assessment Scale

Family resilience was measured with the Family Resilience Assessment Scale. Developed by Sixbey et al[19]. and culturally adapted into Chinese by Li Yuli et al[20]., this scale is used to assess families' recovery and adaptive ability when facing adversity and stress. It contains 3 dimensions and a total of 32 items, namely utilization of social resources, maintenance of a positive attitude, and family communication and problem-solving. A 4-point Likert scale was adopted, with scores of 1 to 4 assigned from "strongly disagree" to "strongly agree". The total score ranged from 32 to 128. Higher scores represented a higher level of family resilience. In this study, the Cronbach's α coefficient of the scale was 0.980.

Data collection

Prior to the formal investigation, a total of 10 patients with hematopoietic stem cell transplantation who met the inclusion and exclusion criteria were enrolled for a pilot survey. The questionnaire was further revised and optimized based on on-site feedback and participants' completion status, so as to guarantee the scientific rationality and feasibility of the research design.

Before data collection, all investigators received standardized training to ensure full familiarity with the survey contents. They were required to accurately illustrate the purpose and significance of this study, obtain informed consent from participants, and complete signed informed consent forms and confidentiality agreements.

The questionnaire survey was conducted through face-to-face interviews. Investigators uniformly explained the filling instructions to participants, after which the patients completed the questionnaires independently. For participants unable to fill in the questionnaires by themselves due to special conditions, investigators read each item aloud and provided objective explanations without any guidance or implication, recorded the answers selected independently by the patients.

All questionnaires were collected on the spot upon completion and immediately checked for missing or incorrect items. Any identified problems were supplemented or corrected by the participants in a timely manner to ensure the integrity and accuracy of the data. The completion time for each questionnaire was approximately 10 to 15 minutes.A total of 300 questionnaires were distributed in this study, and 268 valid questionnaires were retrieved, with a response rate of 89.3%.

Data analysis

IBM SPSS 26.0 statistical software was used for data analysis. The Kolmogorov-Smirnov test was adopted to examine the normality of the data. Measurement data conforming to a normal distribution were described by mean and standard deviation, while those with a non-normal distribution were described using medians and interquartile ranges. Enumeration data were presented by frequency and percentage.

Pearson correlation analysis was conducted to examine the correlations between social support and family coping, family communication, psychological resilience, and family resilience in hematopoietic stem cell transplantation patients.

AMOS 24.0 software was used to construct a structural equation model (SEM) to analyze the effects of social support, family coping, family communication and psychological resilience on family resilience of the respondents. The maximum likelihood method was selected for parameter estimation, and multiple fitness indices were used to evaluate the model fit between family resilience of patients and its influencing factors.

Ethical considerations

This study was reviewed and approved by the Hospital Ethics Committee (Approval No.: 2022-S529). All participants took part in the research voluntarily. Before the questionnaire survey, written informed consent was signed by both the researchers and the participants. The informed consent mainly covered the research purpose of this project and the rights of the respondents. Throughout the investigation and data entry process, all personal information was fully anonymized. All data were stored in encrypted files and only accessible and analyzable by the research team.

Results

Characteristics of the participants

Table 1 presents the demographic characteristics of 268 patients with hematopoietic stem cell transplantation (HSCT). Thepatients' ages ranged from 18 to 68 years (36.16 ± 13.01). Females accounted for 58.58% of the sample, 43.28% of patients were from urban areas, and 58.21% were married. More than half of the patients had an educational level of junior college or above.In terms of family economic status, 53.73% were single-income families, and 45.52% of families had a monthly average income ranging from 2,000 to 5,000 RMB. Regarding disease information, leukemia was the predominant diagnosis, involving 189 patients (70.52%). Most patients (65.67%) were diagnosed within the past two years, and 64.5% received chemotherapy no more than five times.More than half of the patients (57.46%) underwent Human Leukocyte Antigen mismatched (HLA-mismatched) HSCT, and 63.43% received transplantation treatment within the latest one year.

Table 1
Participants' demographic characteristics (N = 268)

Variables	Items	N	Constituent ratio(%)
Gender	Female	157	58.58
	Male	111	41.42
Age	< 20 years	26	9.7
	21–30 years	77	28.73
	31–40 years	74	27.61
	41–50 years	36	13.43
	> 51 years	55	20.52
Occupational status	Employed	95	35.45
	Retired	29	10.82
	Unemployed	81	30.22
	Student	34	12.69
	Others	29	10.82
Residential location	Rural area	79	29.48
	County town	73	27.24
	Urban area	116	43.28
Marital status	Unmarried	102	38.06
	Married	156	58.21
	Divorced or widowed	10	3.73
Educational level	Middle school and below	42	15.67
	High school or secondary technical school	77	28.73
	Junior college/bachelor and above	149	55.6
Family income structure	No-income family	35	13.06
	Single-income family	144	53.73
	Dual-income family	89	33.21
Monthly family income	< 2000 RMB per person per month	41	15.3
	2000–5000 RMB per person per month	122	45.52
	> 5000 RMB per person per month	105	39.18

Variables	Items	N	Constituent ratio(%)
Diagnosis	Leukemia	189	70.52
	Plasma cell or lymphoid neoplasms	46	17.16
	Aplastic anemia	15	5.6
	Others	18	6.72
Duration since diagnosis	<2 years	176	65.67
	2–5 years	69	25.75
	>5 years	23	8.58
Number of chemotherapy cycles	≤ 5 cycles	173	64.55
	6–10 cycles	63	23.51
	>10 cycles	32	11.94
Type of transplantation	Autologous transplantation	43	16.04
	Matched allogeneic transplantation	71	26.49
	allogeneic transplantation	154	57.46
Duration since transplantation	< 1 years	170	63.43
	1–2 years	52	19.4
	> 2 years	46	17.16

Correlation analysis of social support, family coping, family communication, psychological resilience and family resilience in patients with hematopoietic stem cell transplantation

Table 2 presents the relationships among social support, family coping, family communication, psychological resilience, and family resilience as analyzed by Pearson correlation analysis. The results indicated that family communication was negatively correlated with social support ($r = -0.343$, $P < 0.001$), family coping ($r = -0.274$, $P < 0.001$), psychological resilience ($r = -0.378$, $P < 0.001$), and family resilience ($r = -0.465$, $P < 0.001$).

Social support was positively correlated with family coping ($r = 0.692$, $P < 0.001$), psychological resilience ($r = 0.470$, $P < 0.001$), and family resilience ($r = 0.535$, $P < 0.001$). Family coping was positively correlated with psychological resilience ($r = 0.527$, $P < 0.001$) and family resilience ($r = 0.576$, $P < 0.001$). Psychological resilience was positively correlated with family resilience ($r = 0.535$, $P < 0.001$).

Overall, social support (social factor), family coping and family communication (family factors), as well as psychological resilience (individual factor) were not only significantly correlated with family resilience, but also showed significant correlations with one another.

Table 2
Correlation analysis of social support, family coping, family communication, psychological resilience and family resilience in patients with HSCT (N = 268)

Item	Social support	Family coping	Family communication	Psychological resilience	Family resilience
Social support	1				
Family coping	0.692**	1			
Family communication	-0.343**	-0.274**	1		
Psychological resilience	0.470**	0.527**	-0.378**	1	
Family resilience	0.535**	0.576**	-0.465**	0.535**	1
Note: **. Correlation is significant at the 0.01 level (2-tailed)					

Mediating effect

Based on theoretical foundations, literature review, and correlation analysis, our study identified the research variables and established a structural equation model to examine the relationships among social support, family coping, family communication, psychological resilience, and family resilience (Fig. 1). Model fitting results: χ^2/df = 2.517, RMSEA = 0.075, CFI = 0.971, NFI = 0.953, GFI = 0.934, AGFI = 0.875. The model fitting results are good, which can well reflect the true situation of the relationships between family resilience and other variables in HSCT patients.

**P < 0.001. The coefficients presented in Fig. 1 are standardized.

Path analysis demonstrated that family coping, family communication and psychological resilience served as mediating variables in the association between social support and family resilience(Table 3). Specifically, family coping positively predicted family resilience with a standardized path coefficient of 0.356; family communication exerted a negative predictive effect on family resilience, with a path coefficient of − 0.313. Psychological resilience positively predicted family resilience (path coefficient = 0.260), and social support also presented a significantly positive predictive effect on family resilience, with the path coefficient reaching 0.775.

We found that the direct effect of social support on family resilience was not statistically significant, with the total indirect effect being 0.476.Family coping and psychological resilience played a chain mediating effect between social support and family resilience. In the pathway of social support → family coping → family resilience, the path coefficient of the indirect effect was 0.276; in the pathway of social support → family coping → psychological resilience → family resilience, the path coefficient of the indirect effect was 0.081.

Family communication and psychological resilience also exerted a chain mediating effect between social support and family resilience. In the pathway of social support → family function → family resilience, the path coefficient of the indirect effect was 0.095; in the pathway of social support → family function → psychological resilience → family resilience, the path coefficient of the indirect effect was 0.022. All differences were statistically significant ($P < 0.001$).

Table 3
Social support and family resilience among HSCT recipients:the mediating roles of family coping, communication, and psychological resilience

Effect types	Standardized coefficient	Coefficient	Standard Error	*P*	95%CI	
					Lower	Upper
Total indirect effect						
Social support→Psychological resilience	0.476	1.242	0.174	< 0.001	0.912	1.605
Specific indirect effect						
Social support→Family coping→Psychological resilience	0.276	0.719	0.155	< 0.001	0.452	1.065
Social support→Family coping→Family resilience→Psychological resilience	0.081	0.216	0.06	< 0.001	0.116	0.365
Social support→Family communication→Psychological resilience	0.095	0.248	0.069	< 0.001	0.129	0.396
Social support→Family communication→Family resilience→Psychological resilience	0.022	0.058	0.022	< 0.001	0.026	0.114
Direct effect						
Social support→Family coping	0.775	1.055	0.08	< 0.001	0.905	1.218
Social support→Family communication	-0.304	-0.246	0.049	< 0.001	-0.348	-0.136
Family communication→Family resilience	-0.283	-0.668	0.125	< 0.001	-0.937	-0.412
Family communication→Psychological resilience	-0.313	-1.008	0.16	< 0.001	-1.334	-0.645
Family coping→Family resilience	0.411	0.578	0.08	< 0.001	0.408	0.771
Family coping→Psychological resilience	0.356	0.682	0.107	< 0.001	0.436	0.963
Family resilience→Psychological resilience	0.26	0.355	0.075	< 0.001	0.184	0.512

Discussion

The present study revealed that family coping, family communication and psychological resilience exerted a chain mediating effect on the association between social support and family resilience. This indicates that social support can not only provide tangible resources directly, but also indirectly improve overall family resilience by optimizing family coping patterns and enhancing individual psychological resilience. Moreover, the findings partially verify the applicability of the ABC-X model[21]. When families are confronted with stressful life events (A), social support serves as a crucial external resource (B). It shapes family members' cognitive appraisal and adaptive strategies toward stress (C) by facilitating positive family coping and optimizing family communication, which ultimately influences the development of family resilience (X).

A study conducted by Wang et al.[22] indicated that social support, family resilience, and psychological resilience are intercorrelated; however, psychological resilience exerts no direct predictive effect on family resilience. In contrast, the chain mediation analysis of the present study revealed that psychological resilience plays a pivotal role in the pathway through which social support influences family resilience, suggesting that psychological resilience may predominantly function as an indirect mechanism underlying this association. The findings of Zhang et al.[23] indicated that family communication exerts an indirect effect on family resilience through social support or psychological resilience, which is consistent with the results of the present study. Family communication can not only undertake resources derived from social support, but also enhance the psychological resilience of family members through problem discussion, emotional expression, and advice giving, thereby further improving the overall level of family resilience. Therefore, in clinical interventions for HSCT patients, family-centered, multi-level and systematic intervention programs can be formulated. Such programs should integrate social support resources, optimize family coping styles and communication patterns, and strengthen the cultivation of psychological resilience, so as to construct a complete intervention system and ultimately promote family resilience among families of HSCT patients.

The present study identified family coping and psychological resilience as crucial chain mediators linking social support to family resilience in HSCT families. Social support can affect family resilience indirectly via family coping; meanwhile, it also exerts an influence on psychological resilience through family coping pathways, which in turn further shapes the overall family resilience of HSCT patients. Although empirical research directly validating this chain mediation model specifically among HSCT patient families remains limited, existing relevant evidence offers valuable theoretical references and interpretative support for the current findings. Qualitative research[24] has highlighted that social support functions as a core resource for HSCT patients and their families during the adaptation process, which is also positioned as the antecedent variable in the current model. Furthermore, accumulating evidence[25] has demonstrated that adaptive coping strategies are predictive of psychological resilience in HSCT patients post-transplantation, whereas negative coping strategies (e.g., despair, avoidance, and denial) are not significantly associated with mental health outcomes. In addition, a study by Çuhadar et al.[26] revealed that the level of psychological symptoms among HSCT patients and their caregivers is correlated with psychological resilience; specifically, family members with higher levels of psychological resilience typically exhibit lower levels of psychological symptoms.Collectively, these studies imply that within the highly stressful clinical context of HSCT, family coping and psychological resilience serve as critical protective factors for family resilience, further lending solid theoretical justification to the chain mediation model proposed in this study.

From a clinical perspective, multi-target integrated interventions are warranted. Targeted strategies aimed at strengthening social support networks, optimizing adaptive coping patterns, and cultivating psychological resilience among HSCT patients and their families hold considerable potential to improve family resilience and enhance overall adaptive outcomes.

The present study confirmed that family communication and psychological resilience function as sequential chain mediators linking social support to family resilience among HSCT families. Social support can shape family resilience indirectly through family functional communication. Additionally, social support may influence psychological resilience via family communication pathways, which in turn contributes to the enhancement of family resilience in HSCT patient households. Although empirical evidence directly validating this sequential chain mediation model in the HSCT population is still limited, prior relevant literature offers robust theoretical underpinnings to interpret the current research findings. Vladislav et al. [27] validated that family communication quality shapes coping patterns and further predicts psychological resilience. Yang et al.[28] found that elevated family cohesion, including family communication, is significantly associated with reduced symptom distress in HSCT patients, indicating that optimal family functioning and interaction alleviate transplant-related psychological stress. Furthermore, available evidence[29] underscores that clear communication is pivotal to promoting family resilience and adaptation among HSCT caregivers. These results underscore the indispensable role of family communication in HSCT care. Owing to the prolonged treatment course and high complication risks, patients and their families endure enormous stress. Family communication can mitigate stress and enhance family resilience via information sharing, emotional regulation and resource integration. Accordingly, nursing teams should incorporate family communication intervention and resilience cultivation into whole-process HSCT management. Integrating communication guidance, psychological support and standard nursing care can effectively foster family resilience and optimize long-term rehabilitation outcomes for HSCT families.

This study has several limitations. First, its cross-sectional design precludes causal inference and clear determination of the temporal sequence among study variables. Second, while structural equation modeling was used to preliminarily explore the association between social support and family resilience in HSCT patients, in-depth insights into patients' subjective experiences of family resilience were lacking. Future qualitative studies are recommended to validate and extend these findings. Third, this study examined the relationships among family coping, family communication, and family resilience only from the patients' individual perspective. The pathways through which family members' psychological characteristics, coping styles, and communication patterns influence family resilience remain unclear. Therefore, further research is warranted to explore the underlying mechanisms of family interaction processes in affecting family resilience.

Conclusion

The findings of this study show that family coping, family communication and psychological resilience acted as mediators between social support and family resilience. Specifically, family coping together with psychological resilience, as well as family communication combined with psychological resilience, exerted serial mediating effects on the link between social support and family resilience. Future research should

prioritize longitudinal designs and conduct intervention studies targeting social support, family coping, family communication, and patients' psychological resilience. From a dyadic perspective, it is necessary to further explore the mutual influence mechanisms among family members during the formation of family resilience, so as to verify the impacts of social, family, and individual factors on family resilience in patients undergoing hematopoietic stem cell transplantation.

Declarations

Ethics approval and consent to participate

The study has obtained ethical approval from the Ethics Committee of the Third Xiangya Hospital of Central South University((Approval number: 2022-S529, Date: 14.11.2022) as well as approval from the relevant participating hospitals. Before participating in the survey, each participant was provided with an informed consent form detailing the purpose of the study and the participants' relevant rights. Data collection for the study was conducted only after both the research team and the participants had signed the written informed consent. The entire research process was carried out in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing Interests

The authors declare no competing interests

Clinical Trial Registration

Not applicable.

Clinical Trial Number

Not applicable.

Funding

This study was supported by the Natural Science Foundation of Hunan Province (Project No.: 2026JJ60567).

Author Contribution

Study conception and design:TSM, LLZ. Data collection: TSM, GJY, CY. Data entry:GJY, YXJ. Statistical analysis:TSM, ZAD. Drafting of the manuscript:TSM, YXJ. Critical revision of the manuscript: LLZ, ZAD. All

authors read and approved the final version of the manuscript.

Acknowledgement

We sincerely thank all the research participants and hospital staff involved in this survey for their support and assistance.

Data Availability

Raw and analyzed data from the present study can be obtained from the corresponding author following reasonable inquiry.

References

1. Forman, S. J., Negrin, R. S., Antin, J. H. & Appelbaum, F. R. *Thomas' hematopoietic cell transplantation, fifth edition* 1775 (Wiley, 2015). (2 volume set).
2. Xu, L. P. et al. Hematopoietic stem cell transplantation activity in china 2022–2023. The proportions of peripheral blood for stem cell source continue to grow: a report from the chinese blood and marrow transplantation registry group. *Bone Marrow Transpl. 2024*. **59** (12), 1726–1734. http://doi:10.1038/s41409-024-02419-8 (2024).
3. Yu, J., Bhatt, V., Galvin, J., Jariwala-Parikh, K. & Thiel, E. Extended disability leave and related costs among employed patients with versus without graft-versus-host disease following hematopoietic stem cell transplantation. *Support Care Cancer 2025*. **33** (7), 543. http://doi:10.1007/s00520-025-09561-z (2025).
4. Spellman, S. R. et al. Current activity trends and outcomes in hematopoietic cell transplantation and cellular therapy - a report from the cibmtr. *Transpl. Cell. Ther. 2025*. **31** (8), 505–532. 10.1016/j.jtct.2025.05.014 (2025). http://doi
5. Wallace, L. J., Olex, M. M. & McAndrew, N. S. Family-focused practice and policy recommendations to improve the inpatient experience for patients undergoing a stem cell transplant. *Fam Syst. Health 2024*. **42** (3), 438–453. http://doi:10.1037/fsh0000873 (2024).
6. He, Y., Liu, X., Lin, T., Guo, X. & Chen, J. The mediating role of perceived stress in the association between family resilience and psychological distress among gynecological cancer patients: a cross-sectional study. *Bmc Psychiatry 2024*. **24** (1), 622. http://doi:10.1186/s12888-024-06060-z (2024).
7. Chang, L. et al. Symptom burden, family resilience, and functional exercise adherence among postoperative breast cancer patients. *Asia Pac. J. Oncol. Nurs. 2022*. **9** (11), 100129. http://doi:10.1016/j.apjon.2022.100129 (2022).
8. Park, M., Choi, E. K., Lee, H. J., Park, H. E. & Chinbayar, A. Resilience-promoting programs in families of children with cancer: a systematic review. *J. Pediatr. Hematol. Oncol. Nurs.* 2022 2022 May-Jun;**39**(3):185–201. http://doi:10.1177/27527530211055997

9. Shao, M. et al. Family resilience in cancer treatment and key influencing factors: a systematic review. *Eur. J. Oncol. Nurs. 2023*. **66**, 102403. http://doi:10.1016/j.ejon.2023.102403 (2023).
10. Epstein, N. B., Baldwin, L. M. & Bishop, D. S. The mcmaster family assessment device. *J. Marital. Fam. Ther.* **9** (2), 171–. https://doi.org/10.1111/j.1752-0606.1983.tb01497.x (1983). 80.
11. Zimet, G. D., Dahlem, N. W., Zimet, S. G. & Farley, G. K. *The multidimensional scale of perceived social support* p. 30–41 (Lawrence Erlbaum, 1988). [cited 1988]https://doi:10.1207/s15327752jpa5201_2
12. Zhixia, Z., Qianjin, J., Zhixia, W. & Liju, Q. Effect of life events, social support, stress response on coping style in medical personnel. *Chin. J. Behav. Med. Sci.* **13** (05), 560–562 (2004).
13. McCubbin, H. I., Thompson, A. I. & McCubbin, M. A. *Family assessment: resiliency, coping and adaptation : inventories for research and practice* (University of Wisconsin, 1996). http://ci.nii.ac.jp/ncid/BA45166098
14. Wang, Q., Chen, S., Liu, W., Zan, C. & Sheng, Y. Validation of the chinese version of the family crisis oriented personal evaluation scales in families of patients with dementia. *Geriatr. Nurs.* 10.1016/j.gerinurse.2022.03.008 (2022). http://doiMay-Jun;45:131 – 39.
15. Rongfeng, L., Fuzhen, X., Linqin, J. & Wenxin, Z. Revision of family assessment device (fad). *China J. Health Psychol.* **21** (7), 996–1000 (2013).
16. Campbell-Sills, L. & Stein, M. B. Psychometric analysis and refinement of the connor–davidson resilience scale (cd-risc): validation of a 10-item measure of resilience. *J. Trauma. Stress*. **20** (6), 1019–1028. https://doi.org/10.1002/jts.20271 (2007).
17. Connor, K. M. & Davidson, J. R. Development of a new resilience scale: the connor-davidson resilience scale (cd-risc). Depress Anxiety. (2003). 2003;18(2):76–82 http://doi:10.1002/da.10113
18. Danmei, Z., Mei, X. & Yanzhang, L. The reliability and validity of 10-item connor-davidson resilience scale in the community-dwelling older adults. *Chin. J. Behav. Med. Brain Sci.* **27** (10), 942–946 (2018).
19. Tucker Sixbey, M. *Development of the family resilience assessment scale to identify family resilience constructs* p. 181 (University of Florida, 2005). [cited 2005].
20. Yuli, L. *Posttraumatic growth and family resilience inadolescents with parental physical disabilities[D]* (SHANDONG UNIVERSITY, 2016).
21. Reuben, H. Generic features of families under stress. *Families Society: J. Contemp. Social Serv.* **39** (2–3), 139–150. https://doi:10.1177/1044389458039002-318 (1958).
22. Wang, Y. et al. Social support, family resilience and psychological resilience among maintenance hemodialysis patients: a longitudinal study. *Bmc Psychiatry 2024*. **24** (1), 76. http://doi:10.1186/s12888-024-05526-4 (2024).
23. Zhang, Y., Hu, Y. & Yang, M. The relationship between family communication and family resilience in chinese parents of depressed adolescents: a serial multiple mediation of social support and psychological resilience. *Bmc Psychol. 2024*. **12** (1), 33. http://doi:10.1186/s40359-023-01514-7 (2024).
24. Amonoo, H. L. et al. It takes a village: the importance of social support after hematopoietic stem cell transplantation, a qualitative study. *Transpl. Cell. Ther. 2022*. **28** (7), 400–401. http://doi:10.1016/j.jtct.2022.05.007 (2022).

25. Corman, M. et al. The prospective effects of coping strategies on mental health and resilience at five months after hsct. Healthcare (Basel). (2023). 2023;11(13) http://doi:10.3390/healthcare11131975
26. Çuhadar, D., Tanriverdi, D., Pehlivan, M., Kurnaz, G. & Alkan, S. Determination of the psychiatric symptoms and psychological resilience levels of hematopoietic stem cell transplant patients and their relatives. *Eur. J. Cancer Care (Engl) 2016*. **25** (1), 112–121. http://doi:10.1111/ecc.12219 (2016).
27. Vladislav, E. O., Marc, G., Paica, C. I. & Pop, O. Family resilience in a social-ecological context - emotional difficulties and coping strategies. Front Psychol. (2024). 2024;15:1421745 http://doi:10.3389/fpsyg.2024.1421745
28. Yang, Y., Pan, W., Farag, S. S. & Von Ah, D. Effect of family cohesion on symptom distress during hematopoietic stem cell transplantation. Support Care Cancer. (2022). 2022;30(2):1731-37 http://doi:10.1007/s00520-021-06593-z
29. Phelan, R. et al. Multicenter study on caregiver experiences in pediatric hematopoietic stem cell transplantation: part ii. Treatment challenges, communication barriers, and caregiver-driven approaches to mitigation. *Transpl. Cell. Ther. 2025*. **31** (8), 590–591. 10.1016/j.jtct.2025.04.012 (2025). http://doi

Figures

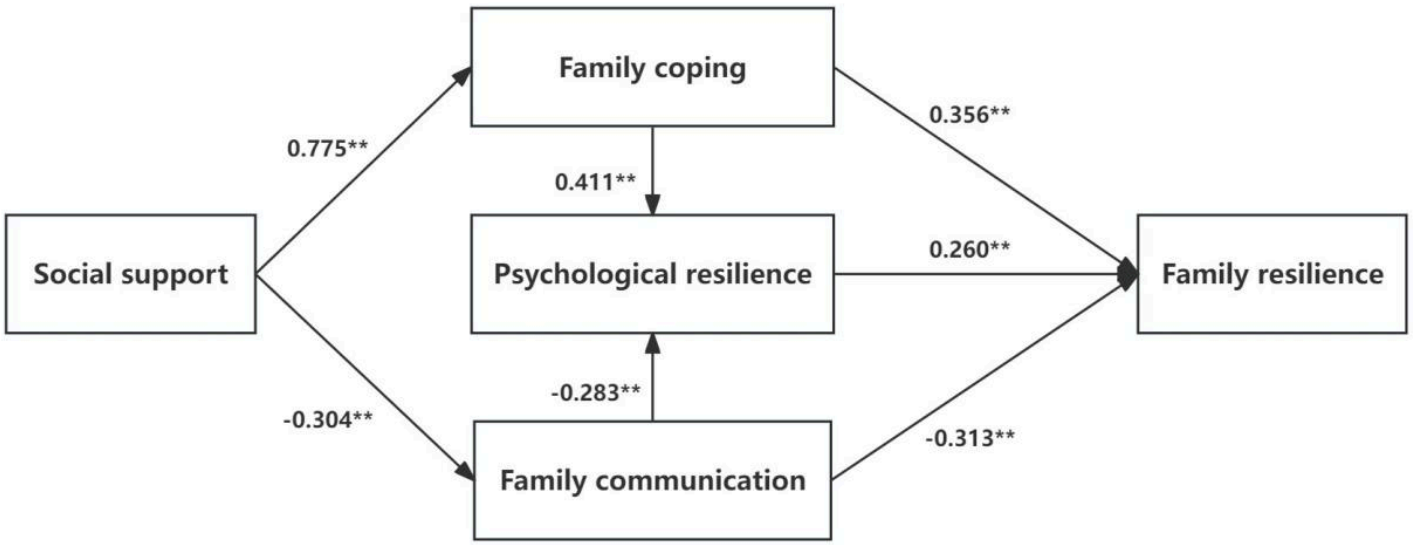


Figure 1

The multiple mediating effect for coping, family function and psychological resilience between social support and family resilience