The mediating role of perceived stress in the association between family resilience and psychological distress among gynecological cancer patients: a cross-sectional study

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Abstract

Background Gynecological cancer patients face various stressors and suffer from severe psychological distress. The activation of family resilience supports patients to overcome daily stressors, yet the relationship between family resilience and psychological distress is poorly understood. The purpose of this study is to investigate the degree of psychological distress in patients diagnosed with gynecological cancer, and whether perceived stress mediate the relationship between family resilience and psychological distress.

Methods A cross-sectional study was undertaken on 358 gynecological cancer patients in China from September 2021 to November 2022. The participants completed surveys that included the Chinese Version of the Family Resilience Assessment Scale, the Perceived Stress Scale, the Hospital Anxiety and Depression Scale, the Distress Management Screening Measure, and socio-demographic questions. Using Pearson's correlation analysis to investigate the association between variables, and the bias corrected bootstrapping method was utilized to establish perceived stress as a mediator.

Results Chinese patients with gynecological cancer experienced a moderate psychological distress. In addition, psychological distress exhibited a negative correlation with family resilience and a positive correlation with perceived stress in gynecological cancer patients (both $P < 0.01$). Perceived stress partially mediated the correlation between family resilience and psychological distress (β=-0.182; 95% CI: -0.224 to -0.140; $P < 0.001$). The total indirect effect value was −0.182, and the total effect value was −3.060.

Conclusions The findings indicate that higher family resilience and lower perceived stress can reduce psychological distress in gynecological cancer patients, and family resilience also tends to reduce perceived stress in cancer patients.

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Clinical staff and psychologist should consciously cultivate patients' family resilience to reduce psychological distress. Meanwhile, identifying potential mediators between family resilience and psychological distress are able to promote the development and assessment of interventions in the future.

Keywords Gynecological cancer, Family resilience, Psychological distress, Perceived stress

Background

Gynecological cancer is one of the most severe diseases that threaten the lives and health of women worldwide, with ovarian, uterine, and cervical cancer being the most common [1, 2]. Approximately 80% of global gynecological cancers are diagnosed in developing countries [3], with the highest incidence rates occurring in Africa and Asia [4]. In China, cervical cancer, ovarian cancer and endometrial cancer rank in the top ten among cancers for women. China has about 130,000 new cases of cervical cancer yearly, accounting for a third of all newly diagnosed cervical cancers worldwide [5]. The diagnosis and treatment of gynecological cancer, along with the possible resulting loss of fertility, can negatively impact women's mental health, induce stress, and trigger a wide range of psychological issues [6–9].

The National Comprehensive Cancer Network (NCCN) summarizes psychological problems that cancer patients may experience as psychological distress. Psychological distress is a complex set of unpleasant experiences involving cognitive, behavioral, affective, societal, mental, and/or physical elements which might hinder an individual's capacity to manage cancer effectively, which includes depression, anxiety, panic, spiritual crises, etc [10]. Among cancer patients in Jordan, 23.4% experienced depression, while 19.9% suffered from anxiety, respectively [11]. In Lebanon, 30.1% of breast cancer patients suffered from moderate to severe depression [12]. Cancer patients with anxiety and depression will likely experience several adverse outcomes, such as altered treatment decision-making, noncompliance with treatment, longer recovery periods, and increased pain intensity [13]. Therefore, further investigation is required to evaluate the extent of psychological distress and its underlying components in patients diagnosed with gynecological cancer.

Family is an essential psychological protective factor for cancer patients, and its protective effect depends on family resilience [14]. Family resilience refers to a family's ability adapt to stress and recover from adversity [15]. Family resilience is able to significantly relieve the adverse effects of pressure, improve family function, and improve individual subjective well-being [16]. Families with high resilience in stressful environments possess a stronger sense of control among cancer patients [17]. However, the influence of family resilience on psychological distress in gynecological cancer patients is still uncertain.

Perceived stress is a global and comprehensive stress structure encompassing the communication between individuals and surroundings when stressors are present [18]. Perceived stress can be defined as "the degree to which individuals appraise situations in their lives as stressful" [19]. Physiological, behavioral, and psychological changes can result from experiencing stress, which may lead to various detrimental effects, such as cardiovascular disease, heightened negative effect, decreased self-esteem, and reduced feelings of control [20]. Prolonged perceived stress can lead to adverse mental health consequences, including anxiety disorders and depression [21]. Women seem more likely to suffer from chronic stress, have a stronger physiological response to social exclusion, and be more susceptible to life events [17]. Thus, it is of vital importance to investigate the perceived stress of gynecological cancer patients for providing clinical intervention strategies.

Previous research investigating resilience and psychological distress in cancer patients focused on individual resilience. Matzka's [22] cross-sectional study included 343 cancer patients reported that there was a negative correlation between individual resilience and psychological stress, and cancer patients with higher individual resilience experienced lower psychological stress. Ilgen [23] conducted a prospective longitudinal study, found that individual resilience significantly impacting distress of neuro-oncological disease in acute stage. However, Henry [24] explored the mechanism by which individual resilience helped people lessen stress, and discovered that coping with adverse circumstances was not a process in which individuals rely on their own advantages to respond stress alone, but an adaptation process by the whole family system. A mixed methods study conducted during the COVID-19 pandemic suggested that family resilience provided a protective and supportive environment for family members to cope with stress and lessen psychological distress, demonstrating a relationship effect between family resilience and psychological distress [25].

However, there is a shortage of empirical research on the association between family resilience and psychological distress among Chinese gynecological cancer patients. Furthermore, it remains unclear if the perceived stress of gynecological cancer patients mediates this relationship. Therefore, this study had three objectives: (1) to determine the prevalence of psychological distress in gynecological cancer patients; (2) to examine whether patients'

perceived stress and family resilience were associated with psychological distress; (3) to evaluate the mediating role of perceived stress in the association between family resilience and psychological distress.

Study hypotheses

Based on the above theory and evidence, the current study created a model to examine the following hypotheses (Fig. 1): (1) The study hypothesizes that gynecological cancer patients in China have a certain degree of psychological distress; (2) The study hypothesizes that psychological distress is lower in families with higher resilience; (3) The study hypothesizes that relationship between family resilience and psychological distress in patients with gynecological cancer is mediated by perceived stress.

Methods

Study design and participants

From September 2021 to November 2022, we conducted a cross-sectional survey throughout Sichuan Province in Southwest China. This study initially recruited 365 gynecological cancer patients through convenience sampling before surgery or radiotherapy. After performing data cleaning and eliminating data that did not meet the inclusion criteria, the study eventually included 358 participants. Participants were required to meet the following criteria for inclusion: (1) aged≥18 years; (2) diagnosed with primary gynecological cancer; and (3) capable of providing informed consent. Participants were excluded if they (1) were diagnosed with a psychiatric illness, had a cognitive disorder and (2) suffered from other severe complications (such as serious heart, liver, and kidney failure).

Procedure

During the patient's hospitalization, everyone completed the paper-and-pencil survey in an independent, quiet room. The questionnaire consisted of five self-report parts: family resilience, distress, anxiety and depression, perceived stress, and demographic characteristics of participants. Before data collection commenced, researchers underwent comprehensive training to ensure familiarity with the questionnaire content and the detailed procedures for its distribution, completion, and retrieval. Participants who had difficulty reading questionnaires were interviewed face-to-face by researchers after the patient management system was reviewed to identify potential qualified participants. Before completing the questionnaire, informed consent was acquired from every participant. The questionnaires were completely anonymous and participants' responses would be kept strictly confidential to protect their privacy. Approximately 10 min were required to complete the survey. After collecting the questionnaires, the researchers meticulously checked each one for completeness and excluded any invalid samples that did not meet logical criteria.

Sample size

The estimated sample size of gynecological cancer patients before the study was tested using G*power 3.1 software. The study's two-tailed alpha level was set at 0.05 with a power (1-b) of 0.8 and included 17 independent variables. The initial sample size calculation was determined to be 143; however, accounting for a 20% estimated drop-out rate, a minimum of 171 participants was necessary for the sample size.

Measures

Independent variable: family resilience

The study using the Chinese Version of the Family Resilience Assessment Scale (FRAS-C) measured six dimensions of family resilience, family communication and problem solving (FCRS), utilizing social and economic resources (USER), maintaining a positive outlook (MPO), family connectedness (FC), family spirituality (FS), and the ability to make meaning of adversity (AMMA) [26]. Each item is rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Total scores varied between 54 and 216, with higher scores denoting stronger family resilience. The FRAS-C possesses well-established psychometric properties. Furthermore, Cronbach's α coefficient value for the entire scale was 0.96 in this study.

Mediator: perceived stress

The Perceived Stress Scale-14 (PSS-14) was utilized to measure perceived stress, which was reliable and valid [18]. The scale consists of 14 items rated from 0 (never) to 4 (very often) on a 5-point scale. The total score is achieved by summing the individual ratings of all 14 items, leading to scores range of 0 to 56. Higher scoring reflected higher degree of perceived stress. The study found a Cronbach's α coefficient of 0.87 for the scale.
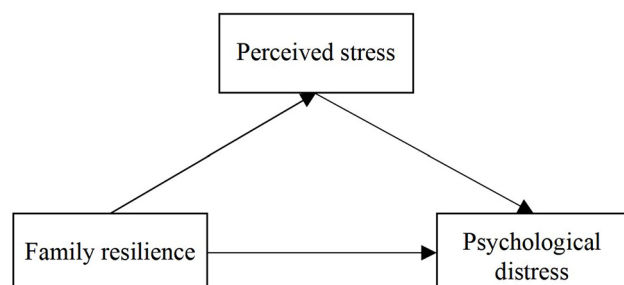
Fig. 1 Hypothesized model

Dependent variable: psychological distress

The assessment of anxiety and depression were carried out using the Hospital Anxiety and Depression Scale (HADS) [27]. The HADS comprises 14 items rated on a 4-point Likert-type scale, ranging from 0 to 3. It comprises two subscales: the cognitive and emotional symptoms of depression (HADS-D) and anxiety (HADS-A). Participants were assigned a total score ranging from 0 to 21 on the HADS, with higher scores representing more severe symptoms of anxiety and depression. The present study obtained a Cronbach's α coefficient of 0.76 for the scale.

Distress was measured by Distress Management Screening Measure (DMSM). The assessment tool consists of a distress thermometer (DT) and a problem list [28]. DT is an uncomplicated self-report tool that uses a line ranging from 0 (no distress) to 10 (extreme distress) to measure an individual's degree of distress. Meanwhile, DMSM has been utilized to assess numerous high-stress populations and has exhibited good validity and reliability. Moreover, Chinese version of DMSM produced good retest correlation coefficients [29].

Covariates

The sociodemographic information gathered from the study included the following details: age at the survey's time (years), the time since the cancer diagnosis (months), nationality (Han Chinese, national minority), marital status (unmarried, married, remarried, divorced, widowed), residence (countryside, suburban, city), education level (none, primary school, high school, university/college), occupation (unemployed/retired, part-time job, full-time job), monthly household income, primary cancer type (cervical, ovarian/fallopian tube, endometrial, others), religion, the primary caregiver's category, and the nature of participants' marital and familial relationships.

Ethical considerations

This study was conducted following the Declaration of Helsinki [30]. The Ethics Committee of West China Second University Hospital, Sichuan University ratified this research, which received the ethics approval number 2021 (194). All participants were briefed on study's purpose and procedure before the study's commencement. They were also reassured that they could discontinue participation at any point or refuse to answer any question. All participants provided informed consent, which confirmed their complete understanding of the procedures.

Statistical analysis

The sociodemographic characteristics of the participants, along with the primary study variables (family resilience, perceived stress, distress, anxiety, and depression), have been outlined using descriptive statistics. Continuous variables were reported using means, standard deviations, and ranges, whereas categorical variables were presented using frequencies and percentages. The Kolmogorov-Smirnov test was used to test whether the data conform to a normal distribution, and the Levene test was used to test the homogeneity of variance. Differences between groups were established using one-way ANOVA, t-tests, and post-hoc analyses. Furthermore, Pearson's r correlations were employed to assess the associations between variables without making any adjustments. IBM SPSS version 26.0 (IBM Corp., Armonk, NY, USA) was utilized to perform all analyses. To estimate the mediating effect of perceived stress, we implemented the bias corrected bootstrapping method, performed by IBM SPSS Amos version 21.0 (IBM Corp., Armonk, NY, USA). Full mediation was confirmed if direct effect was not significant. Partial mediation was confirmed if direct effect was significant. The significance level for all statistical tests was set at 0.05, and all analyses were two-tailed.

Results

Descriptive statistics

Table 1 exhibits the descriptive statistics for all variables utilized in this research. The results showed that the average age of patients with gynecological cancer was 50.2 years (standard deviation [SD=11.2]), ranging from 21 to 83 years. Most patients were Han Chinese, married, and had no religious beliefs. More than 50% of the patients were either retired or unemployed, while the household incomes per capita ranged between 1,000 and 5,000 yuan/mouth. The patients we included had more than four cancer types, most of which were ovarian cancer (42.5%). Patients typically had their primary care provided by their spouses, parents, children, and siblings. A vast majority of patients had good relationships with their spouses and families. The mean scores of distress, anxiety and depression were 2.7±2.3 and 20.5±6.8, respectively, indicating moderate psychological distress. This result was consistent with the first hypothesis in this paper that Chinese patients with gynecological cancer would experience a certain degree of psychological distress.

There were significant differences in psychological distress among gynecological cancer patients in monthly family income, type of primary cancer, marital relationship, and family relationship (Table 2). Post-hoc analysis showed that psychological distress was higher when the patient's monthly household income was less than 1,000 yuan. Patients diagnosed with cervical cancer reported higher psychological distress than those diagnosed with ovarian or fallopian tube cancer. However, other sociodemographic variables had no statistical significance on the psychological distress experienced by patients.

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Table 1 Demographic and clinical characteristics of participants (*N* = 358)

	n	%	M	SD	Range
Age(years)			50.2	11.2	21–83
Nationality					
Han Chinese	345	96.4			
National minority	13	3.6			
Marital status					
Unmarried	9	2.5			
Married	313	87.4			
Divorced	21	5.9			
Widowed	15	4.2			
Religion					
No	337	94.1			
Yes	21	5.9			
Residence					
City	137	38.3			
County	74	20.7			
Town	37	10.3			
Countryside	110	30.7			
Education level					
Primary school and below	99	27.7			
Middle school	112	31.3			
High school	67	18.7			
Junior college	32	8.9			
University/college	47	13.1			
Postgraduate and above	1	0.3			
Occupation					
Retired	86	24			
Unemployed	140	39.1			
Employed	132	36.9			
Household incomes per capita (monthly, yuan)					
≤ 1000	66	18.4			
1000–5000	268	74.9			
≥ 5000	24	6.7			
Primary cancer					
Cervical	152	42.5			
Ovarian/Fallopian Tube	93	26			
Endometrial	62	17.3			
Others	51	14.2			
Time since diagnosis(months)					
≤ 6	345	96.4			
6–12	2	0.5			
≥ 12	11	3.1			
Principal caregiver					
Spouse	192	53.6			
Parent	18	5			
Child	99	27.7			
Sibling	30	8.4			
Others	19	5.3			
Marital relationship					
Very bad	1	0.3			
Bad	2	0.6			
General	38	10.6			
Good	107	29.9			
Very good	170	47.5			

Table 1 (continued)

	n	%	M	SD	Range
None	40	11.1			
Family relationship					
Very bad	0	0			
Bad	0	0			
General	26	7.3			
Good	100	27.9			
Very good	232	64.8			
FRAS-C			161.8	23.5	94–216
AMMA			9.6	1.9	4–12
MPO			21.9	4.1	10–28
FS			5.6	2.4	4–16
FC			23.1	3.6	11–28
USER			26.2	4.9	13–40
FCRS			75.3	11.7	38–92
PSS-14			11.7	6.8	0–32
HADS			20.5	6.8	6–41
DMSM			2.7	2.3	0–10

Note M=mean; *SD*=standard deviation; FRAS-C=Chinese Version of the Family Resilience Assessment Scale; AMMA=ability to make meaning of adversity; MPO=making a positive outlook; FS=family spirituality; FC=family connectedness; USER=utilizing social and economic resources; FCRS=family communication and problem solving; PSS=Perceived Stress Scale; HADS=Hospital Anxiety and Depression Scale; DMSM=Distress Management Screening Measure

Table 2 Differences in psychological distress by sociodemographic variables* (*N*=358)

	Anxiety and depression				
	M	SD	F	P	Post hoc
Household incomes per capita (monthly, yuan)			9.388	<0.001	
≤ 1000(1)	22.75	1.350			(1)> (3)
1000–5000(2)	21.01	0.395			(2)> (3)
≥ 5000(3)	17.41	0.887			
Primary cancer			2.945	0.033	
Cervical(4)	21.26	0.550			(4)> (5)
Ovarian/Fallopian Tube(5)	20.39	0.705			
Endometrial(6)	18.29	0.753			
Others(7)	20.90	1.017			
Marital relationship			4.197	<0.001	
Very bad	/	/			
Bad	17.50	2.500			
General	23.47	1.297			
Good	21.65	0.597			
Very good	19.19	0.496			
None	19.75	1.121			
Family relationship			15.795	<0.001	
Very bad	/	/			
Bad	/	/			
General	21.69	1.502			
Good	23.38	0.653			
Very good	19.07	0.418			

Note M=mean; *SD*=standard deviation. *Only significant or marginally significant results have been listed

Correlations of family resilience, perceived stress, distress, anxiety, and depression

Table 3 summarized the correlation analysis results, which indicated that family resilience, perceived stress, distress, anxiety, and depression were significantly correlated. The findings indicated that family resilience was negatively associated with perceived stress (r=-0.428, P<0.01), distress (r=-0.334, P<0.01), anxiety and depression (r=-0.483, P<0.01). Conversely, perceived stress was observed to be positively correlated with distress (r=0.536, P<0.01), anxiety and depression (r=0.741, P<0.01).
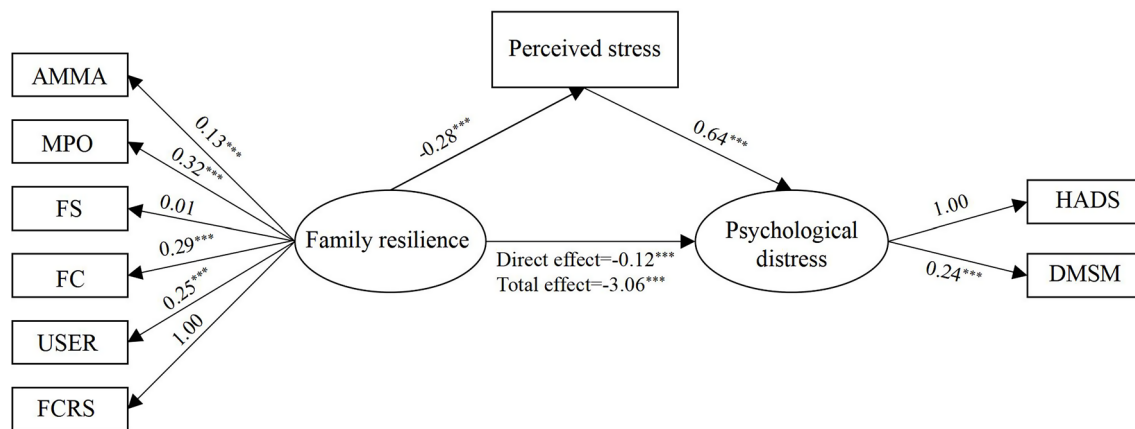
Mediating effect analysis

Structural equation modeling with observed variables was used to investigate the interplay between family resilience, perceived stress, and psychological distress using SPSS Amos (Fig. 2). The results indicated that family resilience negatively predicted psychological distress in gynecological cancer patients (β=-0.124, P<0.001). Conversely, perceived stress positively predicted psychological distress of gynecological cancer patients (β=0.638, P<0.001), and family resilience negatively predicted perceived stress (β=-0.285, P<0.001). In addition, mediating effect of perceived stress was tested by the bias-corrected bootstrapping method. The sample was taken as a population and repeated 5000 times. Indirect effect (mediating effect) was considered as significant when the 95% bootstrap CI of an effect did not include 0. The results showed that the 95% CI (-0.224 to -0.140) of the total indirect effect of perceived stress on family resilience and psychological distress didn't include 0, indicating a significant

Table 3 Correlations between family resilience, perceived stress, distress, anxiety, and depression (N = 358)

	FRAS-C	AMMA	MPO	FS	FC	USER	FCRS	PSS-14	HADS	DMSM
FRAS-C	1									
AMMA	0.802**	1								
MPO	0.890**	0.742**	1							
FS	0.157**	0.018	0.360	1						
FC	0.909**	0.742**	0.772**	0.019	1					
USER	0.712**	0.469**	0.551**	0.176**	0.539**	1				
FCRS	0.958**	0.761**	0.842**	0.018	0.897**	0.541**	1			
PSS-14	-0.428**	-0.429**	-0.470**	0.124**	-0.413**	-0.191**	-0.446**	1		
HADS	-0.483**	-0.482**	-0.509**	0.045	-0.424**	-0.236**	-0.495**	0.741**	1	
DMSM	-0.341**	-0.291**	-0.330**	0.022	-0.309**	-0.182**	-0.334**	0.536**	0.557**	1

Note FRAS-C = Chinese Version of the Family Resilience Assessment Scale; AMMA = ability to make meaning of adversity; MPO = making a positive outlook; FS = family spirituality; FC = family connectedness; USER = utilizing social and economic resources; FCRS = family communication and problem solving; PSS = Perceived Stress Scale; HADS = Hospital Anxiety and Depression Scale; DMSM = Distress Management Screening Measure. **P-value < 0.01

Fig. 2 Model of the mediating effect of perceived stress on the association between family resilience and psychological distress. *Note* AMMA = ability to make meaning of adversity; MPO = making a positive outlook; FS = family spirituality; FC = family connectedness; USER = utilizing social and economic resources; FCRS = family communication and problem solving; HADS = Hospital Anxiety and Depression Scale; DMSM = Distress Management Screening Measure. ***P-value < 0.001. Values on paths are path coefficients (standardized βs)

Table 4 The total effects, direct effects and indirect effects of each path in this model (N = 358)

Estimate		95% CI		
	β	Lower	Upper	*P*
Total effects				
Family resilience → Psychological distress	-3.060	-0.358	-0.251	< 0.001
Perceived stress → Psychological distress	0.638	0.560	0.720	< 0.001
Direct effects				
Family resilience → Perceived stress	-0.285	-0.343	-0.224	< 0.001
Perceived stress → Psychological distress	0.638	0.560	0.720	< 0.001
Family resilience → Psychological distress	-0.124	-0.171	-0.079	< 0.001
Indirect effects				
Family resilience → Perceived stress → Psychological distress	-0.182	-0.224	-0.140	< 0.001

Note β = standardized regression coefficient; CI = Confidence Interval

mediating effect. The 95% CI (-0.358 to -0.251) of the direct effect of family resilience on psychological distress didn't include 0, indicating that the direct effect was significant. Therefore, the types of mediation in this study were partial mediation. The direct effect value of the family resilience on psychological distress was −0.124, the total indirect effect value was −0.182, and the total effect

value was −3.060. The results of mediating effect analysis are shown in Table 4.

Discussion

This study investigated whether the family resilience of gynecological cancer patients in China was related to their psychological distress through the mediation of

perceived stress. Consistent with prior research, the findings supported our hypothesis that gynecological cancer patients experienced moderate psychological stress [31]. Furthermore, our results supported the hypothesis that heightened levels of family resilience were linked with decreased psychological distress among gynecological cancer patients. Interestingly, this relationship was found to be partially mediated by perceived stress.

Levels of psychological distress in gynecological cancer patients. This research discovered that psychological distress was moderate, which was in accordance with Nakamura [32]. According to HADS classification, the incidence of depression in this research was 56.9%, 61.3% of patients reported anxiety, and distress scores were similar to those previously reported in hospitalized cancer patients [33]. Additionally, this study found that gynecological cancer patients from low-income families faced higher psychological distress than those of higher incomes, which was in line with previous reports. A large-scale, cross-sectional epidemiological study suggested that the monthly family income per capita was related to psychological distress in cancer patients [34]. The findings revealed that cancer survivors with higher incomes and employed had a lower risk of experiencing psychological distress than those with lower incomes and unemployment, respectively [35]. In addition, the study revealed that gynecological cancer patients who had better relationships with their spouses and other family members had lower levels of psychological distress. Several researches have indicated that family relationships may forecast psychological distress [36, 37]. Studies conducted on patients diagnosed with lung cancer found that more severe depressive symptoms were significantly related to low familial cohesion and expression and high levels of conflict among patients and their family caregivers [38]. Therefore, medical staff should focus on patients as well as other family members and intervene to promote good relationships among family members, as a supportive family structure leads to psychological well-being [39]. Moreover, cervical cancer is linked to higher levels of psychological distress than other types of gynecological cancers, which can lead to physical and psychosocial impediments for patients. Various studies have demonstrated that patients with cervical cancer are at higher risk of having a history of high-risk sexual behaviors, early sexual experiences, and sexually transmitted infections, which could be linked to risk factors that can aggravate psychological distress [40].

Levels of family resilience in gynecological cancer patients. This research revealed that family resilience was moderate, which was consistent with Xu [41]. This may be due to the following reasons: on the one hand, the majority of patients are married and have a good dyadic relationship in our research. Meanwhile, the vast majority of patients have well-connected family members, and their family structure is stable. On the other hand, compared with other cancers, the special physiological characteristics of gynecological cancers disturb the body image, reduce the femininity, and damage self-esteem, resulting in poor coping capability of patients' families facing cancer stressors [42].

Levels of perceived stress in gynecological cancer patients. The perceived stress was found to be moderately impaired in our study, which was lower than that of Li [43]. Epidemiological studies have confirmed that long-term exposure to high perceived stress will lead to poor spiritual and physical health. In this study, the time of diagnosis was less than 6 months for most of the patients, and they had not received radiotherapy and chemotherapy. Besides, more than 80% of the families in our study had moderate to high monthly income and were able to provide financial support.

The correlation analysis revealed a significant negative correlation between family resilience and psychological distress. The results of our research confirm previous research that has established a correlation between psychological problems and family resilience. Family resilience was higher when anxiety and emotional well-being were low and lower when anxiety and emotional well-being were high [44]. When families have strong and healthy family cohesion, a more robust emotional connection is developed between members, which can be a substantial source of social support for all family members [45].

The structural equation model analysis conducted in this study indicated that perceived stress partially mediated the relationship between family resilience and psychological distress. Our study suggested that perceived stress would affect individual psychological adaptation. The psychological adjustment would be positive when the individual perceived the stress as threatening their psychological well-being [46]. It is critical to emphasize the significance of reducing perceived stress when interpreting the protective effects of family resilience against psychological distress. The assessment of perceived stress is a modifiable factor that can be evaluated during the initial medical visit. Families provide a nurturing environment that facilitates individuals in recuperating from traumatic experiences and acquiring strength and social resources that can assist cancer patients in coping with their situation and reducing their psychological distress [47]. In addition, it has been shown that strong family health and resilience can buffer stress and help families cope with adversity [48, 49]. Health professionals can identify multiple factors that contribute to psychological distress in gynecological cancer patients based on these findings. For example, Virtual health coaching offered during COVID-19 pandemic can substantially

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increase family health and resilience [50]. Family narrative co-construction and systemic family therapy are interventions intended to enhance family resilience, fostering mutual faith and problem-solving capability [51]. Healthcare practitioners can play a crucial role in supporting families by helping them identify available social resources to establish supportive networks within their communities and wider society. Thus, interventions designed to enhance family resilience should be developed and implemented within the clinical practice to minimize perceived stress, strengthen gynecological cancer patients and their families to face adversity, and gain advantages, particularly during the early period of cancer diagnosis.

Study limitations
Several limitations in this study should be illustrated. First, limited by the cross-sectional design of our research, it was impossible to deduce a causal relationship and a dynamic change over time between family resilience and psychological distress in gynecological cancer patients. In the future, longitudinal studies can be carried out to explore the causality and mediation of variables at different stages. Second, the study's participants were limited to a single center in China, which restricts the generalizability of the results. Future research with larger, more diversified samples recruited from multiple centers should be conducted to enhance external validity. Finally, the study only assessed family resilience from the point of view of cancer patients, which may not provide a comprehensive understanding of family functioning. This may not sufficiently reflect family functioning, as it captures only the patient's perspective and may cause mistakes due to a lack of objectivity. A more objective and complete evaluation of family resilience can be obtained by assessing it from the perspective of patients' family members.

Implications for clinical practice
Our findings have implications for diminishing psychological distress in gynecological cancer patients. With growing understanding that family resilience is elastic, healthcare professionals should consciously cultivate patients' family resilience and design effective interventions for family caregivers. In addition, identifying potential mediators between family resilience and psychological distress may facilitate the development and evaluation of future interventions. Our mediation findings emphasize that perceived stress should also be addressed when designing interventions to relieve psychological distress in cancer patients. It is essential for psychologists, nurses and clinicians to accurately assess the perceived stress in patients with gynecological cancer.

Conclusion
To summarize, the results of this study indicate that gynecological cancer patients experienced moderate levels of psychological distress. Furthermore, a notable inverse correlation between family resilience and psychological distress was detected. The findings also suggest that perceived stress partially mediated the connection between family resilience and psychological distress. Thus, evaluating and boosting family resilience could be crucial in mitigating perceived stress and psychological distress among cancer patients.

Abbreviations
NCCN	National Comprehensive Cancer Network
FRAS-C	Family Resilience Assessment Scale-Chinese version
FCRS	Family Communication and Problem Solving
USER	Utilizing Social and Economic Resources
MPO	Maintaining a Positive Outlook
FC	Family Spirituality
AMMA	Ability to Make Meaning of Adversity
PSS	Perceived Stress Scale
HADS	Hospital Anxiety and Depression Scale
DMSM	Distress Management Screening Measure
DT	Distress Thermometer
CI	Confidence Interval
SD	Standard Deviation

Data availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study was approved by the Ethics Committee of West China Second University Hospital, Sichuan University[2021 (194)]. Participants' informed consent forms were obtained, and their anonymity was protected. All participants were aware that they could withdraw at any stage of this study without any adverse consequences.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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