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Examining the role of resilience in the relationship between social support and fear of recurrence among patients with gastric cancer on chemotherapy: a cross-sectional study in Jiangsu, China

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ABSTRACT

Objectives The objective of this study is to investigate the relationships between fear of cancer recurrence (FCR), social support and resilience, and further determine whether resilience mediates social support and FCR among Chinese patients with gastric cancer undergoing chemotherapy.

Design Multicentre cross-sectional survey.

Setting Four hospitals in Jiangsu Province, China, with grade-A tertiary hospital settings.

Participants 755 patients with gastric cancer on chemotherapy across four hospitals in China were included from March 2021 to September 2022.

Outcome measures The Fear of Progression Questionnaire-Short Form (FoP-Q-SF), Connor-Davidson Resilience Scale (CD-RISC) and Social Support Rating Scale (SSRS) were used to test the model's constructs. Statistical analyses were conducted by using IBM SPSS V.26.0 software. PROCESS V.3.4 macro was used to analyse the mediating role of resilience in the relationship between social support and FCR.

Results The mean scores for SSRS, CD-RISC and FoP-Q-SF in patients with gastric cancer receiving chemotherapy were 41.55±7.79, 54.83±18.46 and 30.91±10.11, respectively. 43.3% (n=327) had psychological dysfunction, 56.8% (n=429) had low to medium resilience and 99.1% (n=748) had medium to robust social support. Significant differences exist among three variables, resilience positively correlated with social support, while FCR negatively correlated with resilience and social support (p<0.001). Resilience fully mediated the relationship between social support and FCR (a*b-path=−0.126, 95% CI −0.169 to −0.086).

Conclusions Mediation analysis shows resilience mediates social support and FCR in patients with gastric cancer as the negative effect of social support on FCR was fully mediated by resilience. Interventions targeting these variables may reduce FCR in patients with gastric cancer undergoing chemotherapy.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This multicentre cross-sectional survey was carried out in four tertiary hospitals in China to examine the role of resilience in mediating the relationship between social support and fear of cancer recurrence among Chinese patients with gastric cancer undergoing chemotherapy.
⇒ Its strength also comes from the statistical analysis that was performed using the bootstrap method.
⇒ The cross-sectional study design limits causal inference between variables and temporal assessment.
⇒ Data were collected primarily through self-reported questionnaires, which may introduce potential response biases.

INTRODUCTION

Cancer has increasingly become a major global health issue. Among all cancers, gastric cancer has the fifth-highest incidence and is the third-highest cause of mortality worldwide.[1] Asia contributes 73% of the world's gastric cancer cases, of which nearly half are from China.[1] During the past four decades, the frequency of gastric cancer cases in China's coastal areas was markedly greater than the national average level.[2] The early screening rate of gastric cancer in China is less than 20%,[3] and about 75% of patients suffering from gastric cancer are diagnosed with advanced disease on admission.[4] Radical resection is the main treatment for advanced gastric cancer.[5 6] Postoperative chemotherapy can reduce the local recurrence of tumours and enhance the patient survival rate.[5] However, various adverse reactions caused by treatment have an adverse effect on patients' physiological function, psychological status, social relations and economic status and significantly impact the patients' well-being.[7–9] Among these problems, fear of cancer recurrence (FCR) is commonly reported among cancer survivors.[10] It is the most important psychological and emotional burden of patients with cancer and is also the factor that these patients are the most

unsatisfied and concerned about in terms of their general response to social-psychological needs.[11 12]

FCR refers to the 'fear, worry or concerns related to the possibility of cancer returning or progressing' .[13] A study of 1002 patients with cancer in Germany reported that 17.1% of cancer survivors experienced a high level of FCR, characterised by lower social and emotional functioning levels than that observed in survivors with low FCR.[14] According to Ding's research on the FCR trend in patients with advanced gastric cancer receiving chemotherapy after surgery, it was confirmed that the scores of FCR during the first, third and sixth stages of chemotherapy were at a medium to high level, and the increase was the most pronounced at the early stage of chemotherapy, which decreased slightly at the later stage.[15] Cancer survivors who have experienced FCR are mainly highly sensitive to physical changes, which may result in a synchronous increase in medical utilisation and personal economic burden.[16–18] Researches have demonstrated that FCR is strongly associated with the development of negative emotions such as anxiety,[19] depression[20] and post-traumatic stress disorder.[21] Patients with a high level of FCR are prone to developing sleep disorders,[22] decreased treatment compliance[23] and even increased suicidal risk.

The mechanism of FCR has not been unified. Terror management theory (TMT) is one of the framework models for FCR research. TMT emphasises that humans have instinctive mechanisms and motivations for survival.[24] Unlike animals, humans possess sophisticated cognitive abilities and are alert to the limitations of their own lives. A study conducted in China showed that a large proportion (75%) of patients with gastric cancer were diagnosed at an advanced stage.[4] Patients with gastric cancer who receive chemotherapy after surgical resection are still at risk of recurrence and metastasis.[25] Although chemotherapy is beneficial to patients, they also suffer from side effects. Most patients cannot escape the fate of further deterioration. The instinctual impulse to preserve life gives rise to a unique set of philosophical questions for humanity. For cancer survivors, this tendency towards vigilance can stimulate introspection about the fundamental concepts of existence and death.[26] However, when people realise the necessity of death, they alleviate this anxiety through a series of defence mechanisms. Psychological resilience is the capacity of an individual to deal with and adjust to trauma, adversity, threat and pressure in an effective manner. This positive psychological quality enables patients to approach adversity in a good psychological state and may reduce the impact of FCR.[27] Limited research has been conducted on the correlation between psychological resilience and FCR in patients with cancer,[28–30] which could result in a situation where there is no clear direction or focus on the development of an FCR intervention plan. Therefore, an exploration of psychological resilience and FCR is necessary to gain insights into their inter-relationship.

Moreover, the correlation between psychological distress in patients with cancer and social factors has been widely acknowledged. In particular, the role of social support in the development and progression of cancer has been well documented.[31] Previous studies have demonstrated that social support has a beneficial effect on mitigating FCR or progression among patients with cancer.[32–34] In a longitudinal study conducted by Ding on 135 patients with advanced gastric cancer undergoing postoperative chemotherapy, social support was found to be negatively correlated with the fear of disease progression in the first, third and sixth stages of chemotherapy.[15] Hong *et al* constructed a prediction model of cancer patients' fear of recurrence, and the results showed that improving social support could potentially facilitate the psychological adaptation of chemotherapy patients diagnosed with cancer.[10] Although the precise mechanisms through which social support impacts FCR remain unknown, social cognitive theory suggests that supportive relationships can create a positive environment for those who have experienced trauma, enabling them to reflect on their experiences and find meaning.[35] Research has confirmed that social support, as the external soil for promoting individual mental health, is an important external protection factor for psychological resilience.[36 37] Therefore, social support might serve as a mediator for FCR's impact on patients with gastric cancer who are receiving chemotherapy by enhancing their psychological resilience.

Based on a comprehensive review of prior studies, this study proposed the following hypotheses: H1, social support can negatively predict FCR and H2, psychological resilience mediates the influence of social support on the FCR in patients with gastric cancer undergoing chemotherapy.

METHODS

Design and setting

From March 2021 to September 2022, a descriptive cross-sectional survey was carried out in four oncology departments of across four tertiary hospitals in Jiangsu Province, China, with grade-A tertiary hospital settings. The participating centres were located in Jiangsu Province, Nanjing city, Suzhou city, Wuxi city and Xuzhou city. This study was reported following the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines. This investigation was carried out in compliance with the Declaration of Helsinki ethical principles. Participants provided informed consent prior to participation in the study.

Participants

A convenient sampling method was used to select 755 hospital admissions for patients with gastric cancer receiving chemotherapy in this study. The following criteria were used for inclusion:

1. Patients diagnosed with primary gastric cancer, as defined by the Chinese Society of Clinical Oncology

guidelines for gastric cancer treatment (2018 edition), were confirmed to have lesions originating from gastric mucosal epithelial cells and were undergoing chemotherapy.
2. Patients aged above 18 years.
3. Patients who could verbally communicate properly.
4. Patients who had given informed consent and were willing to participate in the study.

Exclusion criteria were as follows:

1. Patients with severe cognitive dysfunction or mental illness.
2. Patients with severe heart, brain and kidney dysfunction.
3. Patients who were unaware of their condition.
4. Patients who had recently encountered major setbacks causing extreme tension or negative emotions, such as significant personal losses or other substantial life-altering events.
5. Patients with poor compliance, serious adverse events or adverse reactions and other serious comorbidities or deterioration of their condition during the clinical study.

Study measures

Three self-reported instruments, the Fear of Progression Questionnaire-Short Form (FoP-Q-SF), Connor-Davidson Resilience Scale (CD-RISC) and Social Support Rating Scale (SSRS), were used; all the patients completed all the questionnaires. Sociodemographic data including data on age, gender, medical payment methods, education level, marital status, household per capita monthly income, employment status, residence, religion, surgery and confirmed time were collected from participants.

Fear of Progression Questionnaire-Short Form

The 12-item FoP-Q-SF scale was developed by German academic Mehnert *et al*.[38] The measurement tool consists of the state of physical health and social family. The 12 items were rated using a 5-level Likert scoring method, resulting in a range of total scores from 12 to 60 points. Higher scores on the FCR scale indicate greater fear, with a total score of 34 or higher indicating psychological dysfunction.[39] Chinese version of FoP-Q-SF had a high internal consistency coefficient with Cronbach's alpha value of 0.883.[40] Furthermore, the FoP-Q-SF exhibited a high level of internal consistency in this study, with a coefficient alpha of 0.94.

Connor-Davidson Resilience Scale

The CD-RISC was developed by Connor and Davidson.[41] A researcher at Chinese University of Hong Kong named Xiao revised the scale in 2007, which used in this study consisted of 25 items.[42] Each item was evaluated using a 5-point Likert scale, with 0 representing 'never true' and 4 representing 'almost always true', total scores on the scale were in the range of 0–100. A score less than 56 indicated weak psychological resilience, whereas a score of 57–70 indicated normal psychological resilience. Great psychological resilience was defined as a score greater than 70. The reliability of the scale was demonstrated by high Cronbach's alpha coefficients of 0.91, 0.88, 0.80 and 0.60 for the total scale and its three dimensions. The CD-RISC demonstrated a higher reliability in the investigation with a coefficient alpha of 0.96.

Social Support Rating Scale

The development of the SSRS for the Chinese population was carried out by Xiao *et al*,[43] including objective support, subjective support and support availability. The scale includes 10 items, and the total score is 12–66 points. A score of less than or equal to 22 is regarded as low, between 23 and 44 is considered as medium and more than 44 is considered as high. A higher score reflects a greater amount of social support. The Cronbach's alpha coefficients from 0.83 to 0.90 for the total score and its 10 items.[44] SSRS demonstrated a similar Cronbach's alpha of 0.74 in the current.

Survey methods

All records were collected by electronic data capture (EDC) on the second day after patients with gastric cancer were hospitalised for chemotherapy. The EDC is an electronic data acquisition and management system for clinical research established by the hospital science and technology office. Following the receipt of informed consent, data collectors conducted in-person interviews with patients to ascertain their current conditions. Before the survey, all data collectors underwent an online training. To ensure an understanding of the research, study participants received training regarding its objectives and significance, the scale and item descriptions, data collection techniques and necessary preparations. In order to convey the study's purpose and objectives consistently, each data collector used a unified command language before the commencement of the investigation.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Statistical methods

The statistical analyses were carried out using SPSS V26.0. Normality was tested using a Q-Q plot. Intention-to-treat data analysis was performed and found only 0%–5% of missing data among the variables of interest. A random distribution of missing data was observed during analysis ($p>0.05$), and the mode was used to impute missing values. The mediation analysis described by Preacher and Hayes was conducted and performed using PROCESS macro (model 4) for SPSS.[45] To evaluate the direct, indirect and total effects of the proposed model, the research used a bias-corrected bootstrapping approach with 5000 resamples and a 95% CI. Confirmation of a non-zero value within the 95% CI of the indirect impact (a*b) demonstrated the successful establishment of the

Table 1 Sociodemographic and psychosocial characteristics (n=755)

Variables	Category	N	Percentage	Means±SD
Age	≤40	41	5.4	
	41–60	267	35.4	
	>60	447	59.2	
Gender	Male	555	73.5	
	Female	200	26.5	
Education level	Junior high school or less	428	56.7	
	high school	232	30.7	
	College or higher	95	12.6	
BMI	<18.6	158	20.9	
	18.6–24	453	60.0	
	>24	144	19.1	
Provider payments	Medical insurance	724	95.9	
	No medical insurance	31	4.1	
Marital status	Married	730	96.7	
	Other	25	3.3	
Household per capita monthly income	<2000	92	12.2	
	2000–5999	455	60.3	
	≥6000	208	27.5	
Employment status	Employed	224	29.7	
	Unemployed	206	27.3	
	Retired	325	43.0	
Residence	Rural	271	35.9	
	City and town	484	64.1	
Religion	No	729	96.6	
	Yes	26	3.4	
Surgery	No	88	11.7	
	Yes	667	88.3	
Confirmed time	<12 months	633	83.8	
	12–24 months	74	9.8	
	>24 months	48	6.4	
SSRS	Total			41.55±7.79
	≤22	7	0.9	
	23–44	497	65.8	
	≥45	251	33.2	
CD-RISC	total			54.83±18.46
	≤56	429	56.8	
	57–70	170	22.5	
	≥71	156	20.7	
FoP-Q-SF	Total			30.91±10.11
	<34	428	56.7	
	≥34	327	43.3	

BMI, body mass index; CD-RISC, Connor-Davidson Resilience Scale; FoP-Q-SF, Fear of Progression Questionnaire-Short Form; SSRS, Social Support Rating Rate Scale.

mediation model. The sociodemographic correlates were entered as covariates to control the mediation model.

RESULTS

Sociodemographic and psychosocial characteristics

The participants' sociodemographic characteristics are depicted in table 1. All the 755 patients with gastric cancer undergoing chemotherapy completed a questionnaire the day after chemotherapy. The QQ plot showed that all three continuous variables were normally distributed. The percentage of FoP-Q-SF scores ≥34 was 43.3% (n=327). The medium and low level of CD-RISC scores were 22.5% (n=170) and 56.8% (n=429), respectively. Most patients (99.1%; n=748) achieved a good SSRS score.

Correlation between social support, resilience and FCR

As presented in table 2, the correlations between the three primary variables and each dimension are depicted. Social support demonstrated a negative correlation with FCR (r=−0.150, p<0.001), whereas resilience exhibited a negative correlation with FCR (r=−0.403, p<0.001) and a positive correlation with social support (r=0.235, p<0.001). The Pearson correlation analysis showed significant correlations between resilience, social support and FCR (p<0.001). The results validated the hypothesis I: social support can negatively predict FCR.

The mediating role of resilience and its pathway analysis

According to Hayes' guidelines for mediation analysis, SPSS PROCESS macro (model 4) was used to investigate whether a mediating effect of resilience on the link between social support and FCR. 5000 bootstrap samples were selected for this analysis, with FCR as the dependent variable, the relationship between social support and FCR is mediated by resilience. In table 3, it reported the findings of mediation analysis, which indicate a significant inverse relationship between social support and FCR (c=−0.191, p<0.001) when initially examined the total effect of social support on FCR (the 'c-path'). The mediation test revealed a significant indirect effect of resilience, with a mediation effect size of −0.126. The 'a*b-path' had a CI of 95% that did not contain 0 (−0.169 to −0.086), indicating that resilience played a crucial role in mediating the connection between social support and FCR. Furthermore, after controlling for the mediating variable (resilience), social support's direct influence on FCR (c'-path) did not reach statistical significance, and the 95% CI included 0 (−0.154 to 0.025]; c'=−0.065, p=0.155). Therefore, resilience fully mediated the effect of social support on FCR, rather than acting as a partial mediator, as depicted in figure 1. This also validated the second hypothesis: resilience mediates the influence of social support on the FCR in patients with gastric cancer undergoing chemotherapy.

DISCUSSION

The main objective of this study was to assess the relationships among social support, resilience and FCR in patients with cancer. Results indicated a negative correlation between social support and resilience with FCR, whereas a positive relationship between social support and resilience was observed. These findings emphasise the crucial significance of social support in enhancing the psychological well-being of patients with cancer. This view has been confirmed by other researchers.[36 37] More importantly, psychological resilience was found to have the ability to mediate the significant association between social support and FCR among patients with gastric cancer undergoing chemotherapy.

Studies have shown that FCR is not only prevalent among patients with cancer, but it is also the most unmet aspect of their psychosocial needs.[11 12] The fear score of

Table 2 Descriptive statistics and correlations among major variables (N=755)

Item	SSRS				CD-RISC				FoP-Q-SF		
	Total Score	Objective support	Subjective support	Support availability	Total score	Tenacity	Strength	Optimism	Total score	Physical health	Social family dimension
Total social support	1***										
Objective support	0.689***	1***									
Subjective support	0.880***	0.348***	1***								
Support availability	0.665***	0.235***	0.482***	1***							
Resilience	0.235***	0.098**	0.237***	0.189***	1***						
Tenacity	0.203***	0.08*	0.213***	0.151***	0.974***	1***					
Strength	0.276***	0.133***	0.267***	0.217***	0.962***	0.893***	1***				
Optimism	0.177***	0.046	0.173***	0.193***	0.859***	0.77***	0.808***	1***			
FCR	−0.150***	0.043	−0.248***	−0.066	−0.403***	−0.370***	−0.433***	−0.320***	1***		
Physical health	−0.195***	−0.022	−0.281***	−0.061	−0.398***	−0.369***	−0.428***	−0.303***	0.949***	1***	
Social family dimension	−0.091*	0.102**	−0.192***	−0.065	−0.367***	−0.334***	−0.394***	−0.304***	0.951***	0.805***	1***

*p<0.05, **p<0.01, ***p<0.001.
CD-RISC, Connor-Davidson Resilience Scale; FCR, fear of cancer recurrence; FoP-Q-SF, Fear of Progression Questionnaire-Short Form; SSRS, Social Support Rating Scale.

Table 3 The results of the mediation analysis

Mediation path	Coefficient	P value	BCa 95% CI
c	−0.191	<0.001	(−0.284 to −0.098)
a	0.618	<0.001	(0.450 to 0.787)
b	−0.204	<0.001	(−0.241 to −0.168)
a*b	−0.126	–	(−0.169 to −0.086)
c′	−0.065	0.155	(−0.154 to 0.025)

a, model effect of social support on resilience; a*b, indirect effect of social support on FCR; b, model effect of resilience on FCR; BCa 95% CI, the bias-corrected and accelerated 95% CI; c, total effect of social support on FCR; c', direct effect of social support on FCR; FCR, fear of cancer recurrence.

cancer recurrence in patients with gastric cancer undergoing chemotherapy was found to be 30.91±10.11 in this study, which was higher than that reported in domestic researches on patients with glioma and breast cancer and also slightly higher than that reported in a foreign research on patients with melanoma.[30 46 47] According to the diagnostic threshold of the FoP-Q-SF scale, 43.3% of the patients included in this study suffered from psychological dysfunction, indicating that FCR in patients with gastric cancer undergoing chemotherapy needs to be urgently addressed. The reason may be that 75% of gastric cancer cases in China are diagnosed in the advanced stage as even after radical resection treatment,[4] most patients still have recurrence or metastasis, coupled with the selection of patients with gastric cancer undergoing chemotherapy cycle. Chemotherapy, aimed at eradicating residual cancer cells and reducing recurrence, introduces substantial uncertainties about treatment effectiveness, potential side effects and overall prognosis, heightening patients' FCR. Moreover, 88.3% of the patients with gastric cancer we included had undergone postoperative chemotherapy, as detailed in table 1. The transition from surgery to chemotherapy signifies a pivotal shift in the patient's cancer treatment journey, often leading to heightened concerns about long-term health and survival. All these increase the FCR to an extent. Current findings generally suggest that medical service providers should increase FCR screening for these patients to facilitate timely identification, diagnosis and intervention, thus controlling the negative consequences caused by FCR. The CD-RISC score of patients receiving chemotherapy for gastric cancer in this study was measured at 54.83±18.46, which is extremely lower than the domestic norm and the score reported for individuals diagnosed with breast cancer undergoing chemotherapy.[42 48] Of all the included participants, 79.3% scored less than 70 and 56.8% scored less than 56 points. Based on the scoring rule, the level of resilience exhibited by patients with gastric cancer receiving chemotherapy is generally at a low to medium level. Surgical methods for advanced gastric cancer mainly involve distal or proximal gastrectomy and radical resection. These methods are more traumatic, resulting in a long recovery time for patients. In addition, undergoing chemotherapy after surgical treatment and the occurrence of various discomfort reactions such as nausea, vomiting, epigastric pain and fullness aggravates the burden of symptoms and to some extent affects the patient's confidence in disease recovery. This study obtained an SSRS score of 41.55±7.79 in individuals with gastric cancer receiving chemotherapy. Almost all the participants (99.1%) had a moderate to high degree of social support, which is consistent with the conclusion of a prior research.[33] Influenced by traditional Chinese culture, family plays a crucial component in the social support system. Cases included in this study were mostly from Jiangsu Province, which ranks the second in terms of total gross domestic product in China,[49] and with high personal disposable income, the families are able to invest material and spiritual resources to support their members with cancer.

Regarding hypothesis 1, this research discovered that the perceived social support of patients suffering from gastric cancer undergoing chemotherapy was negatively

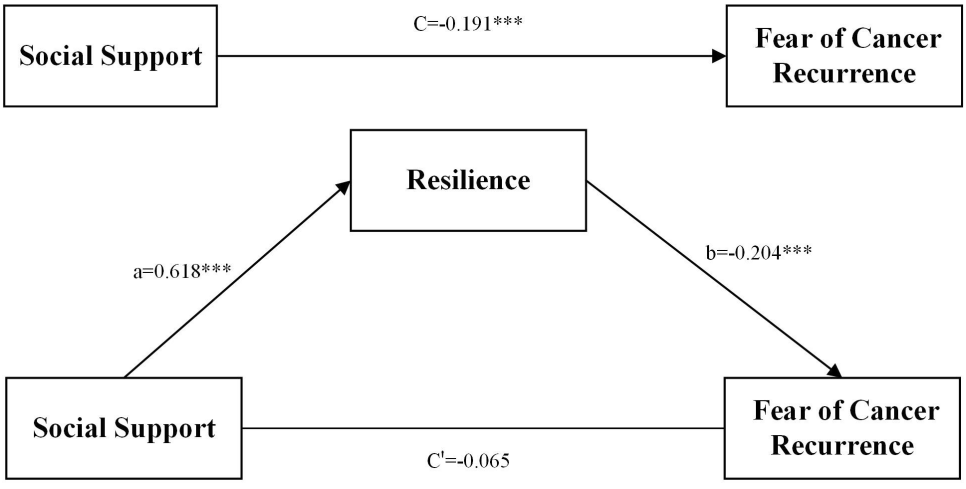

Figure 1 Mediation models showing the direct and indirect effects of social support on FCR via resilience. The numbers on each path represent their respective effect sizes, with *** p<0.001. FCR, fear of cancer recurrence.

correlated with FCR. According to the pathway diagram, social support can negatively predict FCR, that is, the more elevated the degree of social support, the lower the FCR. This result is agreement with the findings of recently published studies.[33 50] Social support has been equated to a barrier that shields individuals from the negative effects of stress on their perception of illness.[51] Patients with gastric cancer will always be aware of the danger of cancer recurrence or progression because diagnosis is mostly made in the advanced stage of the disease, and long-term high vigilance will inevitably cause serious psychological pressure and fear of recurrence. Social support is recognised as an important spiritual pillar for individuals, and patients can reduce the intensity of their psychological suffering with the aid of supportive social relationships, stress response and the sense of uncertainty of illness.[33] Similarly, individuals who possess a comprehensive understanding of social support are more prone to turn to their family members, friends and healthcare professionals for assistance when facing diseases; relieve their bad emotions and inner psychological pressure by relying on help from others; and enhance self-confidence and compliance with treatment and thus reduce the level of FCR. A systematic review concluded that social support helped to cultivate exercise habits in patients, resulting in a 29% improvement in overall survival.[52] Therefore, healthcare providers should fully galvanise the social support system of patients with gastric cancer undergoing chemotherapy by calling on family, friends and healthcare providers to provide material support and psychological care to patients and by encouraging patients to actively seek social support and make reasonable use of the support to improve their mood and reduce the level of fear of recurrence. Zhou and Gu conducted a survey to assess the acquisition and demand for professional social support for patients with gastric cancer were at a medium level, and patients had a high demand for substantive, information, evaluation and emotional support provided by nursing professionals.[53] According to a qualitative study conducted by Korotkin *et al*, anxious patients exhibited a greater desire for companionship, while younger individuals with cancer displayed a greater willingness to receive family care support.[54] Therefore, medical staff need to dynamically, comprehensively and accurately assess patients' need for social support, and flexibly provide personalised supportive care according to the focus of patients' phased needs.

The second proposed hypothesis was also confirmed in this study. Research indicated that perceived social support and psychological resilience contribute significantly to FCR in patients with gastric cancer undergoing chemotherapy, and resilience completely mediates the association between perceived social support and FCR, which has significant implications for both practice and policy. As supported by other theoretical and practical studies,[27 37] this research underscores the crucial role of psychological resilience in patients with cancer. The significant negative correlation that was observed between FCR and psychological resilience suggests that FCR is dependent on the level of psychological resilience. In Richardson's study,[55] resilience was recognised as a process of breaking and reconstructing to reach a new equilibrium, and if the new equilibrium cannot cope with adversity, the individual will enter a new restructuring process that may be more helpful treatment option for patients with gastric cancer undergoing chemotherapy. Individuals with high psychological resilience can build up internal enthusiasm, and they are more inclined to seek help from people within their surroundings in difficult situations. They experience more support, and use it more effectively to enable them to overcome and cope with the disease with an optimistic and upward attitude. Patients who adopt positive coping skills are more likely to voice their worries and locate empathetic listeners. Venting their feelings and concerns can create a sense of calmness that is vital for their mental and emotional stability. The study conducted by Russo *et al* showed that individuals with better mental resilience could release more neuropeptide Y and norepinephrine in response to stress,[56] thus reducing the fear of disease. Therefore, based on the negative prediction of FCR by social support, medical staff can coordinate family members, relatives, friends and social workers to provide support and encouragement to patients, thereby effectively reducing the FCR. In addition, with the full intermediary role of resilience on the relationship between perceived social support and FCR, medical professionals can consider improving the self-recovery ability of patients with gastric cancer undergoing chemotherapy through cognitive behavioural therapy, attention and interpretation therapy, music therapy, etc, so that these patients can cope optimistically with adversity, actively cooperate with treatment and rehabilitation training, energetically seek diversified social support, and ultimately achieve the goal of reducing FCR.

Limitations

There are certain limitations to this study. First, despite the multicentre design adopted in this study, only patients from Jiangsu, China were invited, the external validity of the findings may be constrained when attempting to apply them to other populations. Second, although bias-corrected bootstrapping method was used to conduct testing of proposed model in patients with gastric cancer undergoing chemotherapy, it is relatively difficult to establish causal relationships from a cross-sectional study. It is hoped that longitudinal studies aimed at fortifying the causal relationship between resilience, social support and FCR will emerge in the future.

CONCLUSION

The research findings give evidence of the crucial function of resilience in patients with gastric cancer undergoing chemotherapy, indirectly affecting FCR as well as indirectly affecting it through mediating the impact of social support. Our findings imply that resilience can be

strengthened by enhancing social support, which leads to a lower FCR. These findings have clear practical implications and give vital insight into the correlation among social support, resilience and FCR in Chinese patients diagnosed with gastric cancer. Healthcare providers can use these insights to develop targeted interventions aimed at enhancing resilience and social support among patients with gastric cancer undergoing chemotherapy. Such interventions may include providing psychological support, group therapy and social activities to help patients cope with their illness and treatment. Additionally, further research is needed to explore the mechanisms underlying the relationship between resilience, social support and FCR, as well as to identify other factors that may influence FCR in this population. Understanding these mechanisms may lead to more effective interventions that can improve the quality of life and treatment outcomes for patients with gastric cancer.

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Contributors PD is responsible for the overall content as the guarantor. LY, YL, ZZ and PD contributed to the study conception and design. LY, YL, XW, CX, LY, XL, YZ, WQ and QH made substantial contributions to acquisition of data. LY, XW and ZZ analysed the data and interpreted the findings. CX, LY, XL and YZ assisted in statistical analysis and interpretation of the findings. LY, YL and ZZ wrote this article. ZZ and PD contributed to the critical revision of the manuscript for important intellectual content. All authors have read and approved the final manuscript.

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Patient consent for publication Consent obtained directly from patient(s).

Ethics approval This study involves human participants and the study protocol was reviewed and approved by the Ethical Committee of Jiangsu Province Hospital of Chinese Medicine in Nanjing, China (2021NL-089-02). Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available on reasonable request. All data relevant to the study are included in the article or uploaded as online supplemental information.

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