



Original Article

Self-disclosure, perceived social support, and reproductive concerns among young male cancer patients in China: A mediating model analysis

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ARTICLE INFO

Keywords:

Perceived social support
 Reproductive concerns
 Self-disclosure
 Young male cancer patients

ABSTRACT

Objective: Many young male cancer patients experience reproductive concerns. Self-disclosure might be able to improve patients' perceived social support and reproductive concerns. Nevertheless, these relationships have not yet been confirmed among young male cancer patients. This study aims to investigate the level of reproductive concerns and to identify the mediating role of perceived social support between self-disclosure and reproductive concerns among young male cancer patients in China by developing a structural model.

Methods: This study was a quantitative, cross-sectional design. We used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement guidelines to report this study. A total of 369 young male cancer survivors were recruited by convenience sampling from two tertiary hospitals in Taiyuan, Shanxi, China. Data were collected using a "general data questionnaire", "distress disclosure index" (DDI), "perceived social support scale" (PSSS), and "reproductive concerns after cancer-male" (RCAC-M) via the WeChat mini program "Questionnaire Star" and paper questionnaire. Descriptive statistics, Pearson correlation analyses, and structural equation models were adopted to analyze the data.

Results: Reproductive concerns were at moderate levels and negatively associated with self-disclosure ($r = -0.619, P < 0.01$) and perceived social support ($r = -0.599, P < 0.01$). Self-disclosure indirectly influenced reproductive concerns ($-0.328 \sim -0.159, P < 0.001$) through perceived social support.

Conclusions: Self-disclosure and perceived social support are closely associated with reproductive concerns in young male cancer patients, and perceived social support is a mediator between self-disclosure and reproductive concerns. Healthcare providers could reduce reproductive concerns by enhancing self-disclosure and improving perceived social support.

Trial registration: This study was registered on [ClinicalTrials.gov](https://clinicaltrials.gov) on June 13, 2023 (NCT05914181).

Introduction

Cancer is a major threat to human health. In 2023, the American Cancer Society declared 1,958,310 new cancer cases in the United States, with 1,010,310 in men and 948,000 in women.¹ In 2020, the International Agency for Research on Cancer reported that there were 10,065,305 new cancer cases in men worldwide, with a crude incidence rate of 256.1 per 100,000 and an age-standardized incidence rate by world standard population (ASIRW) of 222.0 per 100,000; in women, there were 9,227,484 new cancer cases with a crude incidence rate of 238.8

per 100,000 and an ASIRW of 186.0 per 100,000.² Overall, the incidence rates of cancer in men are higher than in women, with a particularly wide gap in standardized rates.³ Recently, the incidence of cancer has been on the rise in the young adult population.⁴⁻⁶ With advances in cancer diagnosis and treatment, the overall survival rate in cancer patients has improved. Currently, the five-year survival rate for men aged 15-39 years at cancer diagnosis is $> 81\%$,⁷ hence many young male cancer patients have to face the late adverse effects of cancer treatment. Previous studies have demonstrated that cancer and its related treatments can jeopardize fertility, with some patients exposed to the risk of lifelong infertility.⁸⁻¹⁰

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Fertility-related shame, gender identity disorder, and anxiety due to infertility affect the long-term quality of life (QoL) in young male cancer patients.^{11,12} Therefore, healthcare professionals (HCPs) should not only pay attention to the cure and mortality rates but also to the psychosocial problems due to impaired fertility among young male cancer patients.

Reproductive concerns after cancer refer to an individual's worries about their fertility status and the ability to raise children after cancer, especially during youth.^{13,14} Surveys have shown that 74% of cancer patients had fertility intentions at the time of diagnosis,¹⁵ and 70% of male cancer patients hoped to regain fertility after treatment.¹⁶ Unmet fertility desires are a significant influencing factor for reproductive concerns.¹² Over half of young adult cancer survivors experience reproductive concerns,^{17,18} with 28% to 44% of survivors experiencing moderate to severe levels of reproductive concerns,¹⁹ which persist for several years after cancer treatment.²⁰ Long-term fertility concerns not only increase the risk of psychological disorders^{21–23} but also affect their treatment decisions and compliance,^{24–26} ultimately leading to a prolonged lower QoL for the patients.^{27–29} Currently, research on reproductive concerns among young female cancer survivors is available, whereas studies on young male cancer survivors remain limited, especially concerning psychological interventions to alleviate reproductive concerns.¹⁹ Therefore, exploring factors affecting reproductive concerns is crucial in devising adaptive interventions to improve the reproductive concerns and QoL in young male cancer patients.

Perceived social support refers to the emotional experience of feeling respected, understood, and supported in one's social interactions.³⁰ It plays a vital role in the physical and psychological rehabilitation of patients with various chronic diseases. Good perceived social support can enable patients to face and handle difficulties positively and optimistically, alleviate mental stress, and promote positive psychological adjustment.^{31,32} Patients with increased social support can better alleviate negative emotions through emotional guidance and psychological comfort from spouses, family, and friends.^{33,34} Family support is one of the leading social support resources, and perceived social support positively correlates with family function.^{35,36} Furthermore, reduced family function was associated with higher reproductive concerns among young female colorectal cancer patients.³⁷ A qualitative study discovered that support from partners, family, friends, and HCPs can alleviate reproductive concerns in cancer patients.¹¹ These studies indicate that patients' perceived support may serve as a predictive factor against reproductive concerns, but there are currently few empirical researches exploring that among young male cancer patients.

Self-disclosure refers to sharing one's thoughts, feelings, and experiences with others, which helps enhance the intimacy of individual relationships, adjust cognitive structures, shed negative emotions, and adapt to stressors.³⁸ A qualitative study found that discussing reproductive concerns with patients will make them feel better emotionally supported and minimize their fertility concerns.¹¹ A quantitative research found that active self-disclosure of breast cancer survivors could help alleviate reproductive concerns.³⁹ Moreover, self-disclosure has been applied as an intervention for cancer patients to promote benefit-finding, relieve negative emotions, and improve QoL.^{40,41} Additionally, patients with high levels of self-disclosure can benefit from strengthened relationships and greater social support.⁴² Theoretically, promoting patients' self-disclosure is beneficial in increasing their social support and reducing negative emotions. However, the relationship between self-disclosure and reproductive concerns among young male cancer patients in China, or whether perceived social support mediates this relationship, has been explored by few empirical studies.

Although reproductive concerns are a common psychosocial problem among young cancer patients, previous studies have focused on the reproductive concerns of young female cancer patients primarily. However, the experience of reproductive concerns in young male cancer patients is quite different from that of females.^{15,43,44} Currently, little is known about reproductive concerns of young male cancer patients, especially in the context of Chinese culture. In May 2021, China fully

implemented the "three-child policy," allowing couples to have up to three children, and introduced corresponding fertility support measures such as child-rearing subsidies and extended maternity leave, which increased fertility rates. In addition, traditional Chinese culture emphasizes bloodline inheritance and family continuity. Having a biological child is an important family and social responsibility, especially for men. As such, the reproductive concerns and their related factors among young male cancer patients in China may differ from those in other countries. Therefore, we investigated the level of reproductive concerns and explored the effect of self-disclosure and perceived social support on reproductive concerns among young Chinese male cancer patients. Firstly, we hypothesized that young male cancer patients in China experience a certain degree of reproductive concerns. Secondly, we hypothesized that higher self-disclosure is related to lower reproductive concerns. Finally, we hypothesized that the patient's perceived social support mediates this relationship.

Methods

We used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement guidelines to report this study ([Supplementary Table S1](#)).

Study design, setting and participants

This cross-sectional study was conducted from April to August 2023 and included a total of 369 patients who were (1) male; (2) aged 18–39 years¹⁹; (3) diagnosed with cancer for ≥ 1 year; (4) aware of the disease condition; (5) able to understand and cooperate with the investigation; (6) willing to sign informed consent and voluntarily participate in this study. Patients were excluded if they (1) had severe primary disease, such as liver, kidney, hematopoietic dysfunction, and severe organ failure; (2) had a history of mental illness (determined by reviewing the patient's medical records and interviewing the caregiver), personality disorders, cognitive impairment, or organic brain diseases. Considering the minimal sample size of 200, which is based on the requirements of the structural equation model, and a dropout rate of 10%, the calculated minimum sample size was 220.

Using convenience sampling, participants were recruited from the oncology units of two hospitals in Shanxi, China. All eligible participants completed the questionnaire after they agreed to participate. The survey was anonymous and voluntary. The study protocol was approved by the Medical Ethical Committee of Shanxi Bethune Hospital (YXLL-2023-146). This study was registered on [ClinicalTrials.gov](#) on June 13, 2023 (NCT05914181).

Measurements

- (I) Participant characteristics: General data questionnaire was used to collect participants' characteristics, including age, marital status, number of children, per capita monthly household income, family history, fertility intention, time since diagnosis and types of cancer.
- (II) Self-disclosure: Distress disclosure index (DDI) was used to evaluate self-disclosure of young male cancer patients. It was developed by Kahn in 2001 to evaluate the willingness and tendency of individuals to disclose their personal experiences of pain and other private matters to others.⁴⁵ Cronbach's α of this scale was 0.93. This single-dimensional scale contains 12 items; the Likert 5-level scoring method was adopted for all items. The total score ranges from 12 to 60, with higher scores indicating a stronger willingness for self-disclosure. In this study, Cronbach's α coefficient of this scale was 0.943.
- (III) Perceived social support: Perceived social support scale (PSSS) was used to evaluate the level of perceived social support of young male cancer patients. The scale developed by Zimet et al.⁴⁶

includes three dimensions named friend support, family support and other support, with 12 items scored by Likert 7-grade scoring. The total score ranges from 1 to 84, with high total score indicating high levels of perceived social support. The Cronbach's α of the scale in this study was 0.948.

- (IV) Reproductive concerns: In this study, the reproductive concerns after cancer scale-male (RCAC-M) was used to evaluate the level of reproductive concerns in young male cancer survivors. The scale developed by Gorman includes six dimensions named fertility potential, partner disclosure, child's health, personal health, acceptance and achieving pregnancy, with 18 items scored using the Likert-5 grade scoring method.¹⁴ The total score ranges from 18 to 90, with higher scores indicating stronger reproductive concerns. In this study, Cronbach's α coefficient of this scale was 0.953.

Data collection

Patient information was obtained using convenience sampling from the inpatient unit of a specialized oncology hospital and an oncology center of a general hospital in Shanxi Province, China. First, an investigator screened eligible inpatients from the hospital's electronic medical record system according to the inclusion and exclusion criteria. Subsequently, three nurses from the research team introduced the background and aim of the study to the patients face-to-face. After obtaining patients' written informed consent, paper or electronic questionnaires were distributed to patients based on their preferences (electronically accessible via scanning a QR code on smartphones). To ensure the completeness of the electronic questionnaire, it was mandatory to respond to all questions before submission. Paper questionnaires were collected on the spot and checked for completeness. A total of 400 patients were approached, of whom 369 agreed to participate in the survey, and 31 refused, with the main reasons for refusal including time constraints ($n = 13$), concerns about information leakage ($n = 11$), and no interest ($n = 7$). Of the participants who agreed to participate, 8 dropped out midway through the study. The primary reasons for withdrawal included finding the questionnaire too long, lack of patience ($n = 3$), and other interruptions ($n = 5$). In the end, 361 patients completed the survey (13 patients were asked questions verbally by the nurse during the survey and filled it out on their behalf due to their low literacy level). A total of 156 patients completed electronic questionnaires, and 151 electronic questionnaires were returned, of which 148 were valid. A total of 213 patients filled out the paper questionnaire, and 210 paper questionnaires were finally returned, of which 205 were valid.

Data analysis

Data were entered using Epidata software and analyzed via SPSS24.0 and AMOS24.0 software. Participant characteristics including age, marital status, number of children, per capita monthly household income, family history, fertility intention, time since diagnosis and types of cancer were described using frequency and percentage. Self-disclosure, perceived social support, and reproductive concerns were described using mean \pm standard deviation ($M \pm SD$). Tests of difference in reproductive concerns scores of patients with different characteristics were performed using independent samples *t* test or one-way ANOVA. Correlation among self-disclosure, perceived social support, and reproductive concerns were analyzed using Pearson correlation analysis. Structural equation modeling was used to verify the model's fit with self-disclosure as the independent variable, perceived social support as the mediating variable, and reproductive concerns as the dependent variable. Following fit indices were used to evaluate the model's goodness of fit: $\chi^2/df < 5$, root mean square error of approximation (RMSEA) < 0.08 , standardized root mean square residual (SRMR) < 0.08 , goodness-of-fit index (GFI) > 0.90 , comparative-fit index (CFI) > 0.90 , adjusted goodness-of-fit index (AGFI) > 0.90 , Tacker-Lewis index (TLI) > 0.90 .

The non-parametric Bootstrap method was used to test the mediating effect of perceived social support between self-disclosure and reproductive concerns. The corresponding impact was significant if the bootstrap 95% CI for the estimated mediating effect did not contain 0. A *P*-value of < 0.05 (two-sided) was considered statistically significant.

Ethical considerations

The study was approved by the Medical Ethical Committee of Shanxi Bethune Hospital (IRB No. YXLL-2023-146). All participants provided written informed consent.

Results

Descriptive statistics of participants' characteristics

After excluding questionnaires with incomplete data, the number of participants used for final data analysis was 353. The characteristics of study participants are shown in Table 1. The mean age of young male cancer survivors in the study was (29.65 ± 5.88) years.

Descriptive statistics of self-disclosure, perceived social support and reproductive concerns

The mean RCAC-M score was (2.80 ± 0.81), indicating moderate reproductive concerns, which supported our first hypothesis that young male cancer survivors in China would experience some degree of reproductive concerns. The mean DDI score was (3.32 ± 0.77), and the mean PSSS score was (4.77 ± 0.92) (Table 2).

Correlation analysis among self-disclosure, perceived social support and reproductive concerns

Pearson analysis was used to evaluate the correlations among self-disclosure, perceived social support, and reproductive concerns. The results showed that self-disclosure was negatively correlated with reproductive concerns ($r = -0.619$; $P < 0.01$), which supported our second hypothesis that increased self-disclosure was associated with low reproductive concerns. Furthermore, perceived social support positively correlated with self-disclosure and negatively correlated with reproductive concerns ($r = 0.597$, -0.599 ; $P < 0.01$) (Table 2).

Mediation analysis of self-disclosure, perceived social support and reproductive concerns

A structural equation model was constructed to test the relationships between self-disclosure, perceived social support and reproductive concerns (Fig. 1). The fitting of model data showed that $\chi^2/df = 1.504$, root mean square error of approximation (RMSEA) = 0.038, standardized root mean square residual (SRMR) = 0.029, goodness-of-fit index (GFI) = 0.931, comparative-fit index (CFI) = 0.982, adjusted goodness-of-fit index (AGFI) = 0.914, Tacker-Lewis index (TLI) = 0.980. The model fit index indicated that the model was acceptable (Fig. 1). Bootstrap sampling test was used to investigate the mediating. The results showed that for the effect of self-disclosure on reproductive concerns, the 95% confidence interval of the mediating effect of perceived social support for young male cancer survivors was -0.328 to -0.159 ($P < 0.001$) (Table 3), which supported our third hypothesis that perceived social support mediated the relationship between self-disclosure and reproductive concerns of young male cancer survivors.

Discussion

To deepen the understanding of reproductive concerns among young male cancer patients in China, we analyzed the correlation between self-disclosure and reproductive concerns, and determined whether

Table 1
Characteristics of young male cancer survivors ($N = 353$).

Variables	Categories	<i>n</i>	%	Mean \pm SD	<i>t/F</i>	<i>P</i>
Age (years)	18–30	198	56.09	2.87 \pm 0.81	1.813	0.071
	31–39	155	43.91	2.71 \pm 0.81		
Marital status	Unmarried	131	37.11	3.08 \pm 0.81	13.976	< 0.001
	Married	211	59.77	2.62 \pm 0.75		
	Divorced	11	3.12	2.71 \pm 1.01		
Number of children	None	198	56.09	3.17 \pm 0.67	80.497	< 0.001
	1	83	23.51	2.56 \pm 0.76		
	2 or above	72	20.40	2.05 \pm 0.58		
Per capita monthly household income (RMB)	< 3000	150	42.49	2.83 \pm 0.84	1.477	0.230
	3000–6000	168	47.59	2.81 \pm 0.79		
	> 6000	35	9.92	2.58 \pm 0.77		
Family history of cancer	Yes	43	12.18	3.01 \pm 0.89	3.408	0.066
	No	310	87.82	2.77 \pm 0.80		
Fertility intention	Yes	210	59.49	3.06 \pm 0.71	7.876	< 0.001
	No	143	40.51	2.42 \pm 0.81		
Time since diagnosis (years)	1–2	151	42.78	2.75 \pm 0.79	1.278	0.280
	2–3	133	37.68	2.89 \pm 0.83		
	> 3	69	19.55	2.72 \pm 0.80		
Types of cancer	Leukemia	43	12.18	2.92 \pm 0.86	1.156	0.322
	Nasopharyngeal cancer	26	7.37	2.90 \pm 0.81		
	Lung cancer	35	9.92	2.64 \pm 0.81		
	Testicular cancer	31	8.78	2.73 \pm 0.92		
	Thyroid cancer	45	12.75	2.63 \pm 0.82		
	Glioma	24	6.80	2.76 \pm 0.81		
	Colorectal cancer	33	9.35	2.72 \pm 0.88		
	Lymphoma	83	23.51	2.97 \pm 0.69		
	Prostate cancer	19	5.38	2.58 \pm 0.92		
	Other cancer ^a	14	3.97	2.80 \pm 0.70		

^a Including head and neck tumor, right submandibular mass, mediastinal mass, and parotid tumor.

Table 2
The mean levels and Pearson correlation among self-disclosure, perceived social support and reproductive concerns ($N = 353$).

Variable	Score of each item	DDI	PSSS	RCAC-M
DDI	3.32 \pm 0.77	1	0.597**	−0.619**
PSSS	4.77 \pm 0.92	–	1	−0.599**
Friend support	4.58 \pm 1.06	–	–	–
Family support	5.89 \pm 0.91	–	–	–
Other support	3.85 \pm 1.05	–	–	–
RCAC-M	2.80 \pm 0.81	–	–	1
Fertility potential	2.72 \pm 1.11	–	–	–
Partner disclosure	2.79 \pm 1.10	–	–	–
Child's health	3.60 \pm 0.95	–	–	–
Personal health	2.67 \pm 0.83	–	–	–
Acceptance	2.66 \pm 0.90	–	–	–
Achieving pregnancy	2.34 \pm 0.85	–	–	–

** $P < 0.01$. DDI, distress disclosure index; PSSS, perceived social support scale; RCAC-M, reproductive concerns after cancer-male.

perceived social support mediated this relationship. Overall, our findings confirm the proposed hypothesis.

Our results showed that the average score for reproductive concerns among young male cancer patients in this group was 2.80 ± 0.81 points, which falls within the moderate range compared to the midpoint score of three on the scale. The highest score was child's health dimension, indicating patients' concerns about their children's health were the most severe, similar to findings in young female cancer survivors.^{37,47} In a survey, 65% of young female cancer survivors reported concerns about passing on a genetic cancer risk to their children, regardless of the cancer type not being at high risk for genetic transmission,⁴⁸ highlighting the need for healthcare providers to offer patients more genetic counseling and provide personalized fertility information and advice based on genetic testing results. However, in a mixed method study of reproductive concerns in adolescent and young adult (AYA) cancer patients, male AYA cancer patients had the most serious concerns on fertility potential, which may be age-related. In the study by Tan et al.,⁴³ participants were

aged between 12 and 25 years, and most of the patients had not yet had a child, whereas the participants in this study were aged between 18 and 39 years, and almost half of the patients had already had at least one child at the time of the survey. The score for partner disclosure in reproductive concerns ranked second only to child's health in this study, similar to the results of the study by Tan involving male AYAs.⁴³ Other studies have also reported that many young male cancer survivors fear rejection from their future partners due to their fertility issues.⁴⁹ This study compared partner disclosure among divorced, unmarried participants and married participants and found that unmarried and divorced patients had higher partner disclosure than married patients ($P < 0.05$) (Supplementary Table S2). Therefore, in the future, it is necessary to use qualitative research methods to explore further the differences in partner disclosure of patients with different marital statuses.

Reproductive concerns after cancer involve multiple disciplines, including oncology, reproductive medicine, and psychology. It has been found that receiving multidisciplinary, in-depth reproductive health consultation before cancer treatment was associated with lower reproductive concerns.⁵⁰ Clinical guidelines also recommend fertility counseling before cancer treatment.⁵¹ However, the current state of fertility counseling for young male cancer patients is not optimistic. Only a few of young male cancer patients receive fertility-related information from oncologists or reproductive medicine specialists.^{52–54} What's more, low-quality fertility counseling may exacerbate the reproductive concerns among patients of both sexes,^{18,55} therefore, methods to improve the quality of fertility counseling still require further exploration. In addition, patients can preserve their fertility potential before cancer treatment through sperm cryopreservation and testicular tissue cryopreservation to alleviate fertility concerns.⁵⁶ However, now, the rate of using fertility preservation services before treatment is low among young male cancer patients,^{54,57} which may be related to the cost of long-term storage. Therefore, in clinical practice, HCPs should provide young male cancer patients with as much fertility information; high-quality, in-depth fertility counseling; and methods to preserve fertility as possible before cancer treatment. Moreover, government and relevant departments could fund fertility preservation services for cancer patients.

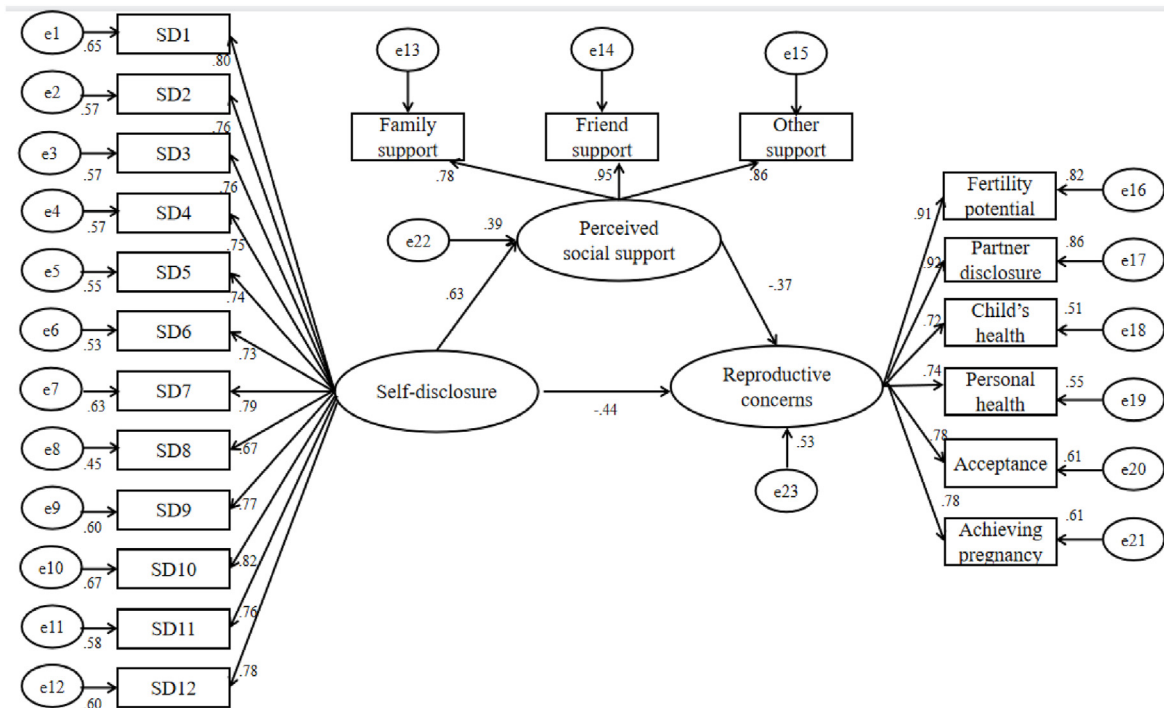


Fig. 1. Path model showing mediating effects of perceived social support between self-disclosure and reproductive concerns after controlling covariates of marital status, number of children and fertility intention.

Table 3
Mediating effects of perceived social support between self-disclosure and reproductive concerns.

Effects	Structural paths	Impact	SE	P	95%	%
Direct effects	SD→RC	-0.438	0.059	< 0.001	-0.551~0.318	65.37%
Mediating effects	SD→PSSS→RC	-0.232	0.043	< 0.001	-0.328~-0.159	34.63%
Total effects	SD→RC	-0.670	0.039	< 0.001	-0.744~-0.590	-

PSSS, perceived social support scale; RC, reproductive concerns; SD, self-disclosure. The analysis was adjusted by marital status, number of children and fertility intention.

This study found that increased self-disclosure was associated with low reproductive concerns, which is consistent with previous findings in young female cancer patients.³⁹ It suggests that HCPs could alleviate patients' stress and reduce their fertility concerns by encouraging them to appropriately and effectively self-express, especially with fellow patients and family members. However, many Chinese breast cancer patients are reluctant to share their worries and express negative emotions with their family and friends.⁵⁸ In this study, young male cancer patients scored 3.32 ± 0.77 on self-disclosure, indicating a medium level that may be influenced by the Confucian ideology in China, which emphasizes harmony in interpersonal relationships through personal socialization, rather than individual emotional expression. That is, individuals are expected to value harmonious interpersonal relationships and integrate into the collective. In this cultural context, young male cancer patients may tend to keep their emotions to themselves to avoid burdening others with excessive emotional expression and to maintain collective harmony. This tendency reduces their likelihood of sharing personal feelings with others. Furthermore, according to Confucian education, exaggerated expression of personal emotions is considered a lack of self-control. All these factors contribute to their moderate level of self-disclosure. In addition, cancer-related shame is common among cancer survivors, leading many patients to choose not to disclose their condition to others.⁵⁹ Hilton et al. found that young males are more secretive about their cancer diagnosis than young females.⁶⁰ This may be because men are typically seen as the pillar of the family and the primary labor force in society, encouraged to display toughness and self-control. This societal role expectation may lead them to internalize their emotions rather than

seek social support or share their plight with others. Therefore, it is crucial to identify factors that promote positive self-disclosure in patients. Multiple studies found that cancer patients who receive more positive responses after self-disclosure are more likely to engage in self-disclosure again in the future.⁶¹⁻⁶⁴ Hence, HCPs should not only promote patients' self-disclosure by designing interventions or providing more channels for self-disclosure^{65,66} but also actively encourage patients' families and peers to provide positive responses and interactions, enabling patients to have positive experiences with self-disclosure and encouraging them to choose self-disclosure in the future, thus forming a virtuous cycle.

This study found that higher perceived social support was associated with lower reproductive concerns among young male cancer patients. This phenomenon may be because emotional care from family, friends, and medical teams, accurate information about treatment and reproductive health protection, specific assistance with daily life, and support that enhances a sense of social belonging not only make patients feel broadly accepted and cared for but also significantly enhance their sense of well-being. This, in turn, allows patients to focus more on family relationships, abilities, and personal traits, helping them reestablish self-recognition and rational self-evaluation, alleviating feelings of inferiority and guilt related to fertility issues.⁶⁷ Meanwhile, encouragement from family and friends can assist patients in actively coping with their problems and rebuilding confidence in fertility. However, since most people have no experience with cancer, they don't know how to give positive support and cope as family members and friends. When parents avoid reproductive conversions or insist patients "don't need to worry"

despite risks, it may exacerbate patient's reproductive concerns.⁶⁸ Therefore, HCPs should actively understand the patient's family and other social support conditions, provide timely psychological guidance to patients and their families, and instruct family members on providing appropriate support.

The study results also confirmed our third hypothesis. In this study, the mediating effect value of perceived social support was 0.232, accounting for 34.63% of the total effect. Numerous studies have found that social support is an important mediating variable in the impact of self-disclosure on outcome variables such as loneliness,⁶⁹ QoL,⁷⁰ and post-traumatic growth,⁴² similar to the findings of this study. According to the disclosure processes model, self-disclosure is a necessary prerequisite to obtain social support. The social support received after disclosure can help improve an individual's well-being and psychological health status, with social support being the most potent mediator between self-disclosure and well-being.⁷¹ Social penetration theory also points out that the development of social relationships is realized through self-disclosure. Self-disclosure plays an important role in patients' social interactions, with highly self-disclosing patients being more adept at sharing personal information and their suffering with others. Family and friends may provide support and tailored advice based on the patient's suffering, leading to a higher perception of support.⁷⁰ Receiving emotional support and help from family, friends, and social networks can help cancer patients manage negative emotions related to reproductive concerns. However, if the individuals confiding in others receive negative responses, it can lead to more significant psychological distress. Therefore, intervening in the reproductive concerns of young male cancer patients by focusing on their perceived social support may result in better outcomes. Moreover, our study results showed that social support partially mediated the relationship between self-disclosure and reproductive concerns, suggesting that other variables may mediate between self-disclosure and reproductive concerns in addition to social support. Therefore, the mechanism of self-disclosure on reproductive concerns still needs further exploration.

Implications for nursing

Our study findings showed that young male cancer patients have reproductive concerns at a moderate level, suggesting that nurses should strengthen fertility-related care. Perceived social support plays a partial mediating role between self-disclosure and reproductive concerns among young male cancer patients. Therefore, nurses can take targeted interventions, such as building harmonious caregiver-patient relationships, organizing workshops and interviews to enhance patients' willingness to self-disclose, and encouraging patients to express their physical and mental feelings through verbal conversations, written expressions, or online forms. Nursing staff plays a crucial role in providing social support to patients. They should be equipped with the skills to respond positively to patients' self-disclosure and guide their family and friends to do the same. Moreover, nurses should develop interventions to improve perceived social support for young male cancer patients.

Limitations

This study had some limitations, which are as follows: (1) Regarding the sampling method, convenience sampling was used, which only selected young male cancer patients from two hospitals in Shanxi Province as research participants. This limited the research area, potentially affecting the representativeness of the sample. In the future, A multi-stage random sampling method could be employed to research multiple regions with increased sample size. (2) Regarding research methodology, a cross-sectional questionnaire survey was conducted, which may have introduced self-reporting biases when patients completed the survey. Additionally, cross-sectional surveys cannot determine causality between variables. Furthermore, future longitudinal studies may be conducted to establish causal relationships between variables. (3) Although this study only included social support as a mediating variable, other mediating

variables, such as marital intimacy, may also impact reproductive concerns. Thus, more variables should be considered in future studies. (4) The type of support unmarried participants received from support providers was not considered in the study design, and future research should explore the types of support received and support needs of this specific population in more detail. (5) This study was retrospectively registered due to our unfamiliarity with relevant registration requirements. Patient recruitment began in April 2023, but the registration was not completed until June 2023, with 128 patients enrolled before the study registration. After a thorough re-review of the data of these 128 patients, we confirmed that the retrospective registration did not compromise the integrity and reliability of the corresponding data. Therefore, the retrospective registration had no impact on the study results. Nevertheless, we acknowledge that although all patients were only included after the ethics review committee approved the study protocol, the retrospective registration could have inevitably affected the study transparency.

Conclusions

Reproductive concerns are at a moderate level among young male cancer patients. Self-disclosure is significantly negatively correlated with reproductive concerns, and perceived social support partially mediated the relationship between self-disclosure and reproductive concerns. This suggests that while promoting young male patients to express their fertility concerns, caregivers should also focus on constructing a social support system and enhancing their perceived social support to maximize its role in reducing patients' reproductive concerns.

Ethics statement

The study was approved by the Medical Ethical Committee of Shanxi Bethune Hospital (IRB No. YXLL-2023-146). All participants provided written informed consent.

Funding

This study was supported by the Nursing Science Foundation of Shanxi Bethune Hospital (Grant No. 2022YH06). The funders had no role in considering the study design or in the collection, analysis, interpretation of data, writing of the report, or decision to submit the article for publication.

CRediT authorship contribution statement

Lihua Wu: Conceptualization; Methodology; Data curation; Formal analysis; Original draft. **Xingyu Chen:** Conceptualization; Methodology; Data curation; Formal analysis; Original draft. **Tingting Dong:** Collect and verify data; Review & editing. **Tao Wang:** Collect and verify data; Review & editing. **Wei Yan:** Collect and verify data; Review & edit. **Linying Wang:** Supervision; Methodology; Review & editing. **Wanling Li:** Supervision, Methodology, Review & editing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

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

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

Acknowledgments

The authors would like to thank all patients who participated in this survey.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.apjon.2024.100503>.

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