Asia-Pacific Journal of Oncology Nursing 11 (2024) 100548

Contents lists available at ScienceDirect

Asia-Pacific Journal of Oncology Nursing

journal homepage: www.apjon.org

Original Article

Perspectives and needs for fertility preservation decision-making in childbearing-age patients with breast cancer: A qualitative study

Mengying Sun [a], Chunlei Liu [a,*], Peng Zhang [b], Yanru Song [c], Ying Bian [b], Sangsang Ke [a], Yanjuan Lu [a], Qian Lu [d,*]

[a] School of Nursing, Hebei University, Baoding, Hebei Province, China
[b] Department of Breast Surgery, Affiliated Hospital of Hebei University, Baoding, Hebei Province, China
[c] Department of Medical Oncology, Affiliated Hospital of Hebei University, Baoding, Hebei Province, China
[d] Division of Medical & Surgical Nursing, School of Nursing, Peking University, Beijing, China

ARTICLE INFO

Keywords:
Breast neoplasms
Fertility preservation
Decision making
Perspective
Need
Qualitative research

ABSTRACT

Objective: To explore the perspectives and needs related to fertility preservation decision-making in patients of childbearing age with breast cancer.
Methods: Semistructured face-to-face interviews were conducted in a tertiary hospital in Baoding, China from July to October 2023. Purposive sampling was used to ensure the diversity of samples. The interview guide is based on the literature review and the discussions within the research team. A traditional content analysis approach was used for data analysis.
Results: A total of 18 participants were interviewed. Three themes emerged from the data: conflicts between subjective desires and concerns, coexistence of objective benefits and challenges, and decision-making support needs. The conflicts between subjective desires and concerns included five sub-themes, the coexistence of objective benefits and challenges also included five sub-themes, and the decision-making support needs included two sub-themes.
Conclusions: Patients faced a difficult trade-off between desires and concerns, benefits, and challenges regarding fertility preservation decisions, with numerous unmet needs. Healthcare professionals should prioritize patients' fertility desires, providing timely fertility preservation information and adequate counseling after a cancer diagnosis. This approach can help alleviate unnecessary concerns, facilitate satisfactory decision-making, and improve patients' quality of life.

Introduction

Breast cancer was the most common malignant tumor worldwide and the most prevalent in women of childbearing age.[1,2] The survival rate of breast cancer increased with the comprehensive development of early screening and improvements in diagnostic and treatment technologies.[3] However, antitumor therapy induced a certain degree of gonadal toxicity, which can cause irreversible damage to fertility, including early menopause and premature ovarian failure.[4] Due to the social and cultural influence of late marriage and late childbearing, many patients still hoped to have children after diagnosis. In addition, in order to avoid the rapid aging of the population caused by the continuous decline in fertility rates, China implemented the "three-child policy" in 2021, supplemented by a series of supporting measures such as early childhood education services and maternity leave,[5] which made patients more willing to have children, especially those whose first pregnancy was not completed.[6] Approximately 18% of patients with breast cancer who had children at the time of diagnosis still desired to conceive, whereas 71.4% of patients without children preferred to conceive after diagnosis.[7]

The rapid development of fertility preservation provided women with the opportunity to become pregnant after treatment for malignant tumors, thus helping some patients with breast cancer achieve their fertility goals and improve treatment compliance and quality of life.[8] Fertility preservation, referred to the application of surgical, medical, or laboratory procedures to preserve the potential for genetic parenthood in adults or children at risk of sterility before the end of the natural reproductive

* *Corresponding authors.*
E-mail addresses: liuchunlei_007@163.com (C. Liu), luqian@bjmu.edu.cn (Q. Lu).

https://doi.org/10.1016/j.apjon.2024.100548
Received 1 May 2024; Accepted 25 June 2024

lifespan.[9] Some countries have currently established guidelines for tumor fertility preservation and recommended that patients with reproductive needs undergo fertility preservation before receiving anticancer treatment.[10,11] However, a significant gap occurred in the practical implementation of these guidelines; for example, in the USA, the implementation of fertility preservation was < 30%.[12] The fertility preservation proportion among patients with cancer in China was even lower, with only 12 and 17 cases of sperm from patients with tumors being frozen within 6–7 years in the Shanghai and Jiangsu human sperm banks, respectively.[13] Compared with fertility preservation in men with cancer, fertility preservation in women with cancer was more complex and time-consuming. The qualitative study results on fertility preservation in young women with early breast cancer by An et al. showed that 10 of 15 patients had fertility intention; however, only three patients underwent fertility preservation before breast cancer treatment.[14] Zhang et al. investigated 308 young women with breast cancer, 81 of whom had fertility intentions; however, only one woman froze her eggs before treatment.[15] Thus, exploring the perspectives and needs of fertility preservation decision-making in patients of childbearing age with breast cancer and helping them make fertility preservation decisions was of great practical significance.

Furthermore, an increasing number of qualitative studies on fertility preservation have been conducted in various countries; however, most studies have explored the fertility preservation experience of young women with various types of cancer after diagnosis, but not for breast cancer.[16,17] Other studies mainly investigated the attitudes on fertility preservation among childbearing patients with cancer, yet patients' needs were not assessed in the decision-making process.[18,19] In addition, the cultural backgrounds of different countries were different, as were the medical guidelines for fertility preservation in patients with breast cancer. Previous studies have shown that traditional Chinese values of fertility may affect fertility intention in patients of childbearing age with breast cancer, thereby affecting the patient's decision to undergo fertility preservation.[20] Therefore, in this study, we aimed to explore the perspectives and needs of fertility preservation decision-making in patients of childbearing age with breast cancer in the context of Chinese culture to provide a basis for constructing targeted decision-support programs for healthcare professionals.

Methods

Study design

This study used descriptive qualitative study to explore the perspectives and needs for fertility preservation decision-making in patients of childbearing age with breast cancer. The descriptive qualitative study can get the perspectives of the participants on a specific topic more directly, and describe it directly in the language similar to that of the participants, so that the research results are closer to the data, which can provide effective information for clinical intervention, scale development, needs assessment, and questionnaire survey.[21,22]

Setting and sample

This study was conducted in the department of breast surgery of a tertiary hospital in Baoding, China between July and October 2023. Samples were collected using a purposive sampling method with the maximum variation sampling technique to ensure the diversity of the samples by comprehensively considering factors, such as patient age, marital status, education level, and disease stage. The participants were patients aged between 18 and 40 years who were diagnosed with breast cancer and were undergoing treatment (surgery, chemotherapy, radiotherapy, and/or endocrine therapy). The language of the participants was Chinese, with no communication barriers. Patients were excluded from this study if they had other malignant tumors, breast cancer recurrence or metastasis, or had been diagnosed with infertility before cancer. Patients with a family history of breast cancer were also excluded because fear of passing the cancer on to future children might limit their desire to have children. The nurses helped introduce eligible participants and screened potential participants through the ward electronic system. Then, we introduced the research objectives to patients face-to-face and invited them to participate in the study. If participants were interested, we would confirm their informed consent and appoint interview time and place. Determination of the sample size followed the principle of information saturation. When there was no new topic, another two participants were interviewed to confirm the data saturation. Twenty-one participants were invited to participate in the study, and three of them did not participate because they were not interested.

Data collection

Semistructured face-to-face interviews were conducted in Chinese by the first author (MY Sun), a female graduate student who has systematically studied qualitative research to explore and understand the perspectives and needs related to fertility preservation decision-making in patients of childbearing age with breast cancer. The interview guide (Table 1) was initially developed by conducting a literature review and the discussions within the research team. Two pilot interviews were conducted in patients of childbearing age with breast cancer to refine the interview guide. Before each interview, the interviewer explained the purpose and requirements to the participants and ensured that all data and participant information were kept confidential. The participants determined the interview time, and the interview took place in a quiet and uninterrupted hospital classroom environment. Only the interviewer and participant were present during the interview. The interviewer carefully listened to the participant's verbal information, asked questions, responded on time, and paid attention to recording the participant's nonverbal behaviors such as tone, expression, and actions. The interviews were audio-recorded throughout the process after seeking participants' consent and lasted for approximately 20–66 mins.

Data analyses

NVivo 20 software was used for data management. Within 24 h of the interview, the recording was automatically transcribed and carefully reviewed by the researchers, and the necessary modifications were made. Data analysis was conducted in Chinese. A traditional content analysis approach was used to organize, summarize, code, and extract themes from the interview materials and identified corresponding excerpt examples.[23] Two researchers read the data repeatedly and immersed themselves in the data to get a sense of integrity. The important phrases and sentences were marked, which was considered as a meaningful unit to encode the interview text, and then open coding was carried out. Similar and related codes were classified into subthemes and themes. Finally, themes and subthemes were defined, and

Table 1
Semistructured interview guide.

1	Do you know that antitumor treatments damage fertility?
2	Do you still want to have (another) children in the future?
3	Do you know any methods that can help you protect your fertility?
4	Do you know anything about fertility preservation?
5	What is your decision regarding fertility preservation?
6	What does fertility preservation decision mean to you? What do you think of fertility preservation decision?
7	What are your concerns when making fertility preservation decision? What difficulties have you encountered?
8	What do you need in the decision-making process?
9	Do you know about patient decision aids? What do you think if there is such a decision support tool to help you make decision?
10	Do you have any suggestions for the type, content, and implementation dissemination of the patient decision aids?
11	Is there anything else you would like to say on this topic?

corresponding examples of excerpts were extracted from the data. In cases of disagreement, a third researcher checked the original materials, and the three researchers discussed until a consensus was reached. A third researcher examined the identified codes, subthemes, and themes. The transcripts were not returned to participants for confirmation. Subsequent interviews did not inform data analysis or emerging codes, subthemes, and themes.

Rigor

The quality criteria of Guba and Lincoln were used to evaluate the quality of the study.[24] Credibility: the interview outline was developed based on a large amount of literature, maximum variation sampling was used to ensure a diverse sample, and excerpts were used to support and illustrate various themes and subthemes to ensure the credibility of qualitative content analysis. Dependability: the interview was conducted by the first author of this study, a female graduate student who has systematically studied qualitative research. A qualitative research methodology expert was invited to analyze the data and reach a consensus through discussion to improve the reliability of the research results. Confirmability: during the interview process, the interview techniques such as questioning, recombination, summarization, and response were repeatedly and comprehensively used to obtain information that reflected the participants' views, attitudes, and understanding as truthfully, comprehensively, and accurately as possible, and the researcher repeated the words of the participants, understood their viewpoints, and repeatedly confirmed with the participants to prevent researcher's viewpoints from being included in the code. Transferability: we provided accurate and detailed descriptions of the inclusion criteria, main characteristics for the participants, and data collection methods, thereby improving the transferability of research results. Reflexivity: before starting the study, the researcher reflected on how their values and professional background might influence the research results. During interviews and analysis, reflexivity was maintained by taking field notes and memos.

Ethical considerations

The study was approved by the Research Ethics Review Committee of the Affiliated Hospital of Hebei University (IRB No. HDFY-LL-2021-142). Informed consent of all participants was obtained before data collection. The research process was completely voluntary, anonymous, and confidential.

Results

Eighteen patients of childbearing age (18–40 years) with breast cancer participated in the study. The mean patient age was 36.1 years, ranging from 24 to 39 years. Most patients had an education level of middle school and were married with two children. All patients were receiving chemotherapy combined with surgery, radiotherapy, and/or endocrine therapy. None of the patients underwent fertility preservation, and three patients had fertility intentions. Detailed characteristics of each patient are presented in Table 2. Twelve subthemes emerged from the three main themes, which are summarized in Table 3.

Theme 1: subjective desires and concerns conflict

This theme described the contradictory thoughts of patients regarding fertility preservation decisions, who faced with serious decision-making conflicts. On the one hand, patients were eager to do fertility preservation to fulfill their desire to become mothers and to meet their expectations regarding the number and sex of their children. On the other hand, they expressed their worries about fertility preservation, concerning it

Table 2
Detailed characteristics of each patient.

	Age (year)	Education level	Relationship status	Children (Yes/No) (gender of children)	Treatment	Cancer stage	Fertility preservation	Fertility intention
P1	35	Middle school	Married	Yes (one boy and one girl)	OP, chemotherapy, and endocrine therapy	I	No	No
P2	34	High school	Married	Yes (one boy)	Neoadjuvant chemotherapy	II	No	No
P3	34	Middle school	Married	Yes (two girls)	Neoadjuvant chemotherapy	III	No	No
P4	37	Middle school	Married	Yes (one boy)	OP, chemotherapy, and endocrine therapy	III	No	No
P5	36	Middle school	Married	Yes (one boy)	OP, chemotherapy, radiotherapy, and endocrine therapy	II	No	No
P6	39	Middle school	Married	Yes (two girls)	Neoadjuvant chemotherapy	II	No	No
P7	39	Primary school	Married	Yes (two girls)	OP, chemotherapy, radiotherapy, and endocrine therapy	III	No	No
P8	36	Primary school	Married	Yes (one girl)	OP, chemotherapy, radiotherapy, and endocrine therapy	II	No	No
P9	33	High school	Married	No (−)	Neoadjuvant chemotherapy	II	No	Yes
P10	24	Undergraduate	Married	No (−)	Neoadjuvant chemotherapy	I	No	Yes
P11	39	Middle school	Married	Yes (two boys)	OP, chemotherapy, radiotherapy, and endocrine therapy	I	No	No
P12	37	Middle school	Married	Yes (two girls)	OP, chemotherapy, and endocrine therapy	II	No	No
P13	39	High school	Married	Yes (one boy and one girl)	OP, chemotherapy, and endocrine therapy	III	No	No
P14	37	High school	Married	Yes (two girls)	OP, chemotherapy, radiotherapy, and endocrine therapy	II	No	No
P15	39	Middle school	Married	Yes (one boy)	OP, chemotherapy, and endocrine therapy	I	No	No
P16	39	College degree	Married	Yes (one boy)	Neoadjuvant chemotherapy	I	No	No
P17	38	High school	Married	Yes (one boy)	OP, chemotherapy, and endocrine therapy	II	No	No
P18	34	Middle school	Single	No (−)	Neoadjuvant chemotherapy	III	No	Yes

OP, operation.

Table 3
Three themes and twelve subthemes.

Theme	Subtheme
Subjective desires and concerns conflict	· Desire to become a mother · Preference for the sex of the child · Expectation of the number of children · Concerns about their own health and children's health · Concerns about fertility preservation effects
Objective benefits and challenges coexist	· Chance for future pregnancy · Give birth to healthier children · Lack of sufficient and correct information · Limitations regarding the decision-making time · Heavy financial burden
Decision-making support needs	· Patient decision aids needs · Family support needs

influenced their own health and children's health, as well as about the effectiveness of fertility preservation.

Subtheme 1: desire to become a mother

Most patients expressed that they were eager to become mothers, which could enhance their social roles and confidence, and fulfilled their needs for love and belonging. In addition, due to China's "three-child policy," patients said that their desire to become mothers was stronger and that doing fertility preservation could satisfy their desire to become mothers. *P7: "Doing fertility preservation is the determination as a woman to have children." P8: "As a woman, the desire to become a mother will prompt me to make fertility preservation decisions."*

Subtheme 2: preference for the sex of the child

With the development of social culture, the traditional Chinese concept of son preference has gradually weakened. Most patients expressed a desire to satisfy their preference for the gender of their children through fertility preservation; they preferred a son and a daughter. *P4: "My first child is a son, and it would be great if fertility preservation allows me to choose the gender of my child and guarantees that I will give birth to a daughter." P15: "For most families in the countryside, if their first child is a daughter, they will do fertility preservation because they urgently want a son."*

Subtheme 3: expectation of the number of children

The traditional idea of "raising children for old age" has promoted the decision-making of fertility preservation. For patients who already had one child, they hoped to have another child through fertility preservation and hoped that the two children can accompany each other, rely on each other, and reduce the pressure of raising parents in the future. *P13: "I have one child, and I feel that she is lonely. Two children can take care of each other." P16: "If I have another child, my children can take care of me together when I'm old; they won't be very tired."*

Subtheme 4: concerns about their own health and children's health

Patients' concerns about their own health prevented them from making fertility preservation decisions. Patients expressed they were worried their continued survival, and they tended to prioritize survival over future fertility. In addition, patients with hormone-positive breast cancer were concerned that fertility preservation increased the probability of cancer recurrence. *P8: "After breast cancer diagnosis, I feel that my life comes first, my body comes first, and myself comes first. Nothing else (fertility preservation) is important, so I won't take any risks." P16: "I have hormone-positive breast cancer, and doing fertility preservation will cause hormonal changes in my body and a higher risk of recurrence. I am afraid of recurrence and suffer more."*

Another concern mentioned by patients was the health of future children. Some patients expressed they were worried about passing their cancer genes on to their future children since the impact of fertility preservation on children's health was difficult to estimate. *P4: "Will the frozen eggs have (breast cancer) genes? I am afraid that my cancer gene will be passed on to my offspring." P11: "If I do fertility preservation, I would definitely have to do genetic testing first, and even if the results are fine, I would also be worried about passing on the risk of cancer to my future child."*

Subtheme 5: concerns about fertility preservation effects

Although the rapid development of fertility preservation techniques offered the possibility of future fertility, patients believed that the unknown quality of oocytes and transplantation success rates meant that successful fertility could not be guaranteed 100%. Therefore, patients expressed concerns about the success rate of fertility preservation technology in gestating embryos. *P7: "It will probably take me a long time to adjust my body to prepare for fertility preservation, and it may not be successful finally." P5: "Can the end result of fertility preservation be guaranteed to be good? I still need to take medication for 5 years, can it (frozen eggs) be well used after 5 years? Can I successfully give birth to a baby then?"*

Theme 2: objective benefits and challenges coexist

This theme addressed patients' difficult trade-off between the benefits and challenges regarding fertility preservation decisions. Patients believed that fertility preservation provided them with reproductive opportunities and helped them have healthier children, but they also faced challenges such as lack of information, time constraints in decision-making, and heavy financial burden. When weighing the benefits and challenges of fertility preservation, patients faced an endless battle, and making decisions was often difficult.

Subtheme 1: chance for future pregnancy

Patients expressed that they might not be sure about their future fertility plans before undergoing cancer treatment; however, given the adverse effects of breast cancer treatment on future fertility, they still wanted options for the future. Therefore, they tended to opt for fertility preservation as a security measure for future pregnancy. *P10: "I am not currently considering having children, but I still want to do fertility preservation to leave a security for my pregnancy and avoid regret in the future." P14: "I will consider fertility preservation, although there is no plan for conception at present, but it is still very happy to have a security."*

Subtheme 2: give birth to healthier children

For patients who needed endocrine therapy, in addition to treatment-related fertility damage, there was a risk of age-related fertility decline after treatment. As a result, some patients acknowledged it was necessary to do fertility preservation at a relatively young age, freezing younger and higher quality eggs before treatment could help them have healthier children after treatment. *P4: "Freezing high-quality eggs before treatment and giving birth to healthier children after treatment will increase our happiness levels." P9: "I am still young, and I may remain fertile after treatment, but everyone knows that chemotherapy drugs are poisons. Freezing healthy eggs before chemotherapy can make future children healthier."*

Subtheme 3: lack of sufficient and correct information

Patients stated that they had a great need for information, including the different options for fertility preservation treatments and their benefits and risks, but lack sufficient information support regarding fertility preservation decisions. Healthcare professionals, who were the main source of information for patients, subjectively believed that patients with children had no reproductive needs and did not take the initiative to discuss fertility preservation issues with patients. *P3: "I would like more fertility preservation information, such as what fertility preservation methods are available and what examinations are needed for fertility preservation." P17: "Healthcare professionals didn't talk to me about fertility preservation, probably thinking I'd already had two sons."*

Due to the limited information available, most patients obtained relevant information through media or the internet, but the insufficient

ability of patients to identify correct fertility-related information increased misunderstandings and hindered them from making fertility preservation decisions. *P12: "This is the first time I've heard of fertility preservation. Is it similar to In Vitro Fertilization (IVF)?" P10: "I found some information on the Internet that I can't get pregnant after the diagnosis of breast cancer. If I get pregnant, my hormones would be out of balance, and my life would be in danger. I think the information (online) is quite scientific now."*

Subtheme 4: limitations regarding the decision-making time

Fertility preservation should be performed after cancer diagnosis and before the treatment. Once cancer treatment begins, fertility may be irreversibly damaged. However, patients perceived they are under great time pressure to make fertility preservation decisions within a short period before anti-tumor treatment. *P6: "I don't have time to consider it (fertility preservation) because I undergo a major pathological examination first, followed by a series of other examinations. The doctor quickly gives me an infusion of (chemotherapy) drugs after the final results comes out." P14: "I don't have time to think about anything else (fertility preservation) because I come back to the hospital after surgery and start chemotherapy directly."*

Subtheme 5: heavy financial burden

The heavy financial burden is the most common reason patients give up protecting their fertility. Patients recognized that they bore the costs of cancer treatment and raising children. Meanwhile, they have to account for a series of additional follow-up costs, such as freezing and transplants, which were not covered by health insurance. *P9: "Doing fertility preservation depends on whether I can afford it. If I can't afford it, I won't do it." P13: "My cancer treatment requires a large amount of money, and I also have to raise two children; now things are very expensive, so I can't afford to raise them, let alone do fertility preservation."*

Patients with heavy financial burdens were eager to obtain financial help and hoped that fertility preservation could be covered by public health care in the country to reduce their financial burden. *P1: "For cancer patients, the most important thing is the cost. We hope that our country can provide strong support and that fertility preservation can be covered by insurance." P4: "What we need most is financial support because we have already spent a lot on cancer treatment, and there is no extra money to pursue fertility preservation. It will be too late for us to save enough money to do it."*

Theme 3: decision-making support needs

This theme encompassed the decision-making support needs of patients in relation to fertility preservation decisions. In the process of decision-making, patients needed the guidance of patient decision aids and the support of family members, so as to make decisions more adequate and improve the quality of decision-making.

Subtheme 1: patient decision aid needs

Decision-making regarding fertility preservation needs to be supported by patient decision aids that provides comprehensive information. Patients had positive attitudes toward patient decision aids and expressed a desire to receive the decision-making guidance before treatment. *P6: "I hope there are tools for fertility preservation because there will be people in need. We breast cancer patients will have the idea of using it before treatment."*

Patients had different preferences regarding the content, form, and publicity of the patients decision aids. Compared to written information, patients believed that web-based patient decision aids had better privacy and were more acceptable and popular. *P16: "I recommend web-based tools which have good privacy, while the written information is easily seen by others. I don't want people to see that I am doing fertility preservation." P17: "Web-based tools are more acceptable, easy to understand, convenient, and few people read written information now."* The content of patient decision aids was the determining factor of patients' understanding of information, and patients expected the content of patient decision aids to be easy to understand and avoided the use of medical terminology. *P14: "I don't understand medical terminology, so I hope you can note the general meaning of medical terminology and use plain language."* Patients believed formal platforms should be used to promote patient decision aids. *P18: "It is best to promote patient decision aids on formal platforms such as hospital official platforms and WeChat accounts because it is difficult to believe that on an informal app."*

Subtheme 2: family support needs

Good family support was crucial for patients making fertility preservation decisions as it encouraged them. Patients expressed they craved support and understanding from their families. Good family support could help them improve negative emotions and increase their confidence in making fertility preservation decisions. *P2: "I should also show my husband fertility preservation so that he can understand me. Otherwise, he thinks it is not difficult to have a child." P14: "If I do fertility preservation and have another child, I hope I can get the support and help from my family; you know the helplessness of taking care of a child, the child is crying, and I want to cry with her."*

Discussion

We explored the perspectives and needs of fertility preservation decision-making in patients of childbearing age with breast cancer in China and identified three themes and twelve subthemes, of which the three themes included conflicts between subjective desires and concerns, coexistence of objective benefits and challenges, and decision-making support needs. In the fertility preservation decision-making process, patients faced dual pressures of fertility and survival: they were eager to become mothers but were worried about health issues. They valued the benefits of fertility preservation but also faced objective challenges such as lack of information, time constraints in decision-making, and heavy financial burden. Moreover, patients had unmet needs in decision-making.

Our results showed that fertility preservation decisions could fulfill patients' desire for fertility. Fertility desire included the desire to become a mother and the preference for the sex and number of children.[25] In the context of Chinese culture, women were responsible for giving birth to their children and raising the next generation, having children remained among the goals of women with cancer of childbearing age to pursue a happy life. Patients believed that fertility was a symbol of women's identity and role recognition and that cancer and its treatment will not change the significant desire of some patients to have children.[26] Most patients believed that having both a son and a daughter was an ideal family structure, which brought more hope and happiness to the family.[27]

However, some concerns hindered their fertility preservation decision-making, consistent with the results of previous studies.[16] After being diagnosed with breast cancer, patients believed that survival and fertility were contradictory and that maintaining their own health was the primary consideration. Patients, especially those with hormone-positive breast cancer, believed that pregnancy might endanger their lives, and fear of cancer recurrence made it difficult for them to consider fertility preservation.[28] In addition, due to concerns about the health of future children, some patients had to give up fertility preservation, which would lead to higher levels of reproductive anxiety.[29] An increasing number of studies have confirmed the effectiveness and safety of fertility preservation.[30,31] According to current evidence, breast cancer usually had a better prognosis, and having children did not increase the risk of recurrence after treatment or affect future children.[32] Studies have shown that adequate fertility counseling can effectively reduce patient concerns regarding fertility issues.[33] Therefore, healthcare professionals should pay more attention to patients' contradictory thoughts in the decision-making process, provide adequate fertility counseling to eliminate patients' misunderstandings about pregnancy after breast cancer, and reduce patients' concerns, so as to help patients make fertility

preservation decisions and meet their fertility desires.

Our findings showed that some patients believed that it would be beneficial to preserve their fertility. They felt that they had a choice on this issue and that their future fertility was guaranteed. In addition, freezing younger and higher quality eggs before treatment could help them have healthier children after treatment, which was a positive experience. Patients who recognized the benefits of fertility preservation would be more likely to make fertility preservation decisions.[34] It is important to promote fertility preservation on a formal platform, mainly referring to an official online platform, because it can improve patients' awareness of fertility preservation and its benefits, so as to help them choose and implement appropriate fertility preservation programs.

However, these benefits of fertility preservation may be insufficient to offset the objective challenges, such as lack of information, time constraints in decision-making, and heavy financial burden, resulting in none of the patients undergoing fertility preservation. This indicated that we should also help patients overcome barriers and challenges in the decision-making process of fertility preservation while helping them understand the benefits of fertility preservation.[35] Our findings showed that patients reported receiving insufficient and ill-timed information, consistent with the results of previous studies.[36] Patients believed that healthcare providers were their main source of information; however, healthcare professionals did not provide them with sufficient fertility preservation information, which may be attributed to their insufficient fertility preservation knowledge.[37] A lack of information on fertility preservation led to misconceptions, which can easily aggravate decision-making conflicts and regrets related to fertility.[38] For example, Campbell et al. observed that the more fertility information available, the lower the degree of decision regret.[38] In this study, patients were expected to receive fertility preservation information about the risks, benefits, success rates, and costs at the beginning of their diagnosis to allow sufficient time for decision-making and made more careful considerations.[39] Therefore, healthcare professionals should receive training and continuing education on fertility preservation to provide targeted information support to patients.

In addition to training healthcare providers in providing information to patients, the effectiveness of patient decision aids and fertility navigators in providing fertility preservation information to patients has been confirmed.[40,41] A patient decision aid can be a useful supplement to the fertility preservation information provided by healthcare providers to inform patients about fertility preservation choices and guide decision-making processes.[42] Our results showed that patients had a positive attitude toward decision aids and hoped to use it. Most countries have developed and applied patient decision aids in the practice of fertility management for patients of childbearing age with breast cancer.[40,42] However, no fertility preservation patient decision aid was available in mainland China. Therefore, future research should draw on existing research results and experiences to develop patient decision aids that were suitable for the Chinese social and cultural context to guide patients in making better decisions. Moreover, fertility preservation decision-making can be further supported by fertility navigators. Due to the busy work schedule, healthcare professionals do not have enough time to provide fertility preservation consultation for patients. The research results of van den Berg et al. showed that fertility navigators can assist oncologist to provide patients with basic fertility preservation counseling, referring patients to the reproductive department to determine fertility preservation plans. After that, the fertility navigator followed up the patients and provided them with psychological support.[41] The presence of fertility navigators freed healthcare professionals from their complicated work and allowed them to devote more time to diagnosis and treatment, and also improved the efficiency of patients' access to fertility counseling and fertility preservation–related services.[43] In the future, the role of fertility navigators in patients of childbearing age with breast cancer should be considered.

Furthermore, our findings confirmed the results of previous studies on the role of family and financial support in fertility preservation decision-making.[44] Families provided the most solid type of financial and emotional support for patients. Healthcare providers should encourage family members to communicate with and provide financial support for patients. The cost of fertility preservation should be covered by medical insurance, or financial assistance should be provided to patients to help reduce the burden of decision-making.

Limitations

This study had some limitations. First, as a qualitative research, so the research results cannot be generalized. Second, the spouse's role in fertility preservation decisions was not considered. Third, the maximum variation sampling method was used to achieve the diversity of sample groups; however, only one unmarried patient was included in this study, our findings may be related to specific population characteristics. Fourth, interviews at the time of diagnosis may provide a deeper understanding of the perspectives and needs of fertility preservation decision-making. We interviewed the patients during treatment, which may have led to a recall bias. Finally, patients did not receive fertility preservation, and interviews with patients who have undergone fertility preservation may provide additional insights into the research findings.

Implications for nursing research and education

It is necessary to conduct large-scale studies targeting patients without children and patients who have made fertility preservation decisions from different regions. The opinions of family members, especially spouses, have an important impact on patients' fertility preservation decisions, and the role of spouses should be considered in future research. In addition, future research can validate the role of patient decision aids and fertility navigators in providing fertility preservation counseling to patients and helping them make decisions.

Conclusions

Patients faced a difficult trade-off of desires and concerns and benefits and challenges regarding fertility preservation decisions, and there are a number of unmet needs. Healthcare providers should understand the patient's fertility desire, and provide adequate fertility counseling to alleviate unnecessary concerns of patients. Simultaneously, they should inform young patients with breast cancer regarding fertility preservation early before treatment, enhance patient awareness of fertility preservation and its benefits, help them make satisfactory fertility preservation decisions, and improve their quality of life.

Acknowledgments

We gratefully thank the patients who took part in this study and for generously sharing their time and thoughts with us.

CRediT authorship contribution statement

Mengying Sun: Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Writing – Original draft. **Chunlei Liu**: Conceptualization; Methodology; Formal analysis; Writing – Review and editing. **Peng Zhang**: Investigation; Data curation. **Yanru Song**: Investigation; Data curation. **Ying Bian**: Investigation; Data curation. **Sangsang Ke**: Methodology; Formal analysis. **Yanjuan Lu**: Methodology; Formal analysis. **Qian Lu**: Conceptualization; Methodology; Formal analysis; Writing – Review and editing. All authors had full access to all the data in the study, and the corresponding authors had final responsibility for the decision to submit for publication. The corresponding authors attest that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Ethics statement

The study was approved by the Research Ethics Review Committee of the Affiliated Hospital of Hebei University (IRB No. HDFY-LL-2021-142). All participants provided informed consent.

Funding

This work was supported by the National Natural Science Foundation of China (Grant No. 72174011); the High-level Talent Scientific Research Start-up Project of Hebei University (Grant No. 521100221002); and the Post-graduate's Innovation Fund Project of Hebei University (Grant No. HBU2024SS002). 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.

Declaration of conpeting interest

The authors declare that they have no conflict of interest. The corresponding author, Prof. Qian Lu, is an editorial board member of *Asia-Pacific Journal of Oncology Nursing*. The article was subject to the journal's standard procedures, with peer review handled independently of Prof. Lu and their research groups.

Data availability statement

The data for the results of this study are available at the authors' request. Data are not made public due to privacy and ethical restrictions.

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

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

References

1. Miller KD, Fidler-Benaoudia M, Keegan TH, Hipp HS, Jemal A, Siegel RL. Cancer statistics for adolescents and young adults, 2020. *CA Cancer J Clin*. 2020;70(6):443–459. https://doi.org/10.3322/caac.21637.
2. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021;71(3):209–249. https://doi.org/10.3322/caac.21660.
3. Yoon TI, Hwang UK, Kim ET, et al. Survival improvement in hormone-responsive young breast cancer patients with endocrine therapy. *Breast Cancer Res Treat*. 2017;165(2):311–320. https://doi.org/10.1007/s10549-017-4331-4.
4. Turnbull AK, Patel S, Martinez-Perez C, Rigg A, Oikonomidou O. Risk of chemotherapy-related amenorrhoea (CRA) in premenopausal women undergoing chemotherapy for early stage breast cancer. *Breast Cancer Res Treat*. 2021;186(1):237–245. https://doi.org/10.1007/s10549-020-05951-5.
5. The State Council of The People's Republic of China Third-Child Policy to Unleash Childbirth Potential. https://english.www.gov.cn/statecouncil/ministries/202107/22/content_WS60f8c05ac6d0df57f98dd5ef.html. Accessed May 24, 2024.
6. Dong CL, Wang H. Current status and influencing factors of fertility concern in breast cancer patients of childbearing age. *Health Med Res and Pract*. 2023;20(6):120–126. https://doi.org/10.11986/j.issn.1673-873X.2023.06.025.
7. Wu KJ, Chen YY, Jin YC, Zhang P, An P. Investigation on fertility of young women with early breast cancer. *Chin J Pract Surg*. 2021;41(11):1262–1268. https://doi.org/10.19538/j.cjps.issn1005-2208.2021.11.15.
8. Martinez F. Update on fertility preservation from the Barcelona International Society for Fertility Preservation-ESHRE-ASRM 2015 expert meeting: indications, results and future perspectives. *Hum Reprod*. 2017;32(9):1802–1811. https://doi.org/10.1093/humrep/dex218.
9. Gosden RG. Fertility preservation: definition, history, and prospect. *Semin Reprod Med*. 2009;27(6):433–437. https://doi.org/10.1055/s-0029-1241051.
10. Kim H, Kim SK, Lee JR, Hwang KJ, Suh CS, Kim SH. Fertility preservation for patients with breast cancer: the Korean Society for Fertility Preservation clinical guidelines. *Clin Exp Reprod Med*. 2017;44(4):181–186. https://doi.org/10.5653/cerm.2017.44.4.181.
11. Oktay K, Harvey BE, Loren AW. Fertility preservation in patients with cancer: ASCO clinical practice guideline update summary. *J Oncol Pract*. 2018;14(6):381–385. https://doi.org/10.1200/JOP.18.00160.
12. Gwede CK, Vadaparampil ST, Hoffe S, Quinn GP. The role of radiation oncologists and discussion of fertility preservation in young cancer patients. *Pract Radiat Oncol*. 2012;2(4):242–247. https://doi.org/10.1016/j.prro.2011.12.001.
13. Fu LL, Zhang KS, Gu YQ. Fertility preservation for male adolescent cancer patients. *Natl J Androl*. 2017;23(3):262–266. https://doi.org/10.13263/j.cnki.nja.2017.03.013.
14. An P, Wang G, Wu KJ, Ding Y. Experience of fertility preservation decision-making in young women with early breast cancer: a qualitative study. *Chin Nurs Manag*. 2022;22(3):354–358. https://doi.org/10.3969/j.issn.1672-1756.2022.03.007.
15. Zhang LX. *Investigation on Reproductive Demand of Young Women with Breast Cancer*. Beijing: Peking Union Medical College; 2015 [Published dissertation].
16. Komatsu H, Yagasaki K, Yamauchi H. Fertility decision-making under certainty and uncertainty in cancer patients. *Sex Reprod Healthc*. 2018;15:40–45. https://doi.org/10.1016/j.srhc.2017.12.002.
17. Quinn GP, Vadaparampil ST, Lee JH, et al. Physician referral for fertility preservation in oncology patients: a national study of practice behaviors. *J Clin Oncol*. 2009;27(35):5952–5957. https://doi.org/10.1200/JCO.2009.23.0250.
18. Dahhan T, van der Veen F, Bos A, Goddijn M, Dancet E. The experiences of women with breast cancer who undergo fertility preservation. *Hum Reprod Open*. 2021;2021(2):hoab018. https://doi.org/10.1093/hropen/hoab018.
19. Hershberger PE, Sipsma H, Finnegan L, Hirshfeld-Cytron J. Reasons why young women accept or decline fertility preservation after cancer diagnosis. *J Obstet Gynecol Neonatal Nurs*. 2016;45(1):123–134. https://doi.org/10.1016/j.jogn.2015.10.003.
20. Zhu F, Liu C, Chen Q, Qiang W, Lu Q. Revision and psychometric evaluation of a fertility intention scale for young women with breast cancer in Chinese Mainland. *Asia Pac J Oncol Nurs*. 2023;10(9):100264. https://doi.org/10.1016/j.apjon.2023.100264.
21. Sandelowski M. Whatever happened to qualitative description? *Res Nurs Health*. 2000;23(4):334–340. https://doi.org/10.1002/1098-240x(200008)23:4<334::aid-nur9>3.0.co;2-g.
22. Sandelowski M. What's in a name? Qualitative description revisited. *Res Nurs Health*. 2010;33(1):77–84. https://doi.org/10.1002/nur.20362.
23. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res*. 2005;15(9):1277–1288. https://doi.org/10.1177/1049732305276687.
24. Guba EG, Lincoln YS. *Effective Evaluation: Improving the Usefulness of Evaluation Results through Responsive and Naturalistic Approaches*. San Francisco: Jossey-Bass; 1981.
25. Zhou CH. A conceptual model of ideology on childbearing. *Popul Soc*. 2007;23(2):5–7. https://doi.org/10.3969/j.issn.1007-032X.2007.02.001, 47.
26. Penrose R, Beatty L, Mattiske J, Koczwara B. Fertility and cancer – a qualitative study of Australian cancer survivors. *Support Care Cancer*. 2012;20(6):1259–1265. https://doi.org/10.1007/s00520-011-1212-y.
27. Black KZ, Eng E, Schaal JC, et al. The other side of through: young breast cancer survivors' spectrum of sexual and reproductive health needs. *Qual Health Res*. 2020;30(13):2019–2032. https://doi.org/10.1177/1049732320929649.
28. Hsieh PL, Huang SM, Chien LY, Lee CF, Hsiung Y, Tai CJ. Risk-benefit perception of pregnancy among breast cancer survivors. *Eur J Cancer Care*. 2018;27(2):e12696. https://doi.org/10.1111/ecc.12696.
29. Raghunathan NJ, Benedict C, Thom B, Friedman DN, Kelvin JF. Young adult female cancer survivors' concerns about future children's health and genetic risk. *J Adolesc Young Adult Oncol*. 2018;7(1):125–129. https://doi.org/10.1089/jayao.2017.0050.
30. Carneiro MM, Cota AM, Amaral MC, et al. Motherhood after breast cancer: can we balance fertility preservation and cancer treatment? A narrative review of the literature. *JBRA Assist Reprod*. 2018;22(3):244–252. https://doi.org/10.5935/1518-0557.20180032.
31. Lambertini M, Mastro LD, Pescio MC, et al. Cancer and fertility preservation: international recommendations from an expert meeting. *BMC Med*. 2016;14:1. https://doi.org/10.1186/s12916-015-0545-7.
32. Lambertini M, Kroman N, Ameye L, et al. Long-term safety of pregnancy following breast cancer according to estrogen receptor status. *J Natl Cancer Inst*. 2018;110(4):426–429. https://doi.org/10.1093/jnci/djx206.
33. Kim J, Deal A, Balthazar U, Kondapalli LA, Gracia C, Mersereau JE. Fertility preservation consultation for women with cancer: are we helping patients make high-quality decisions? *Reprod Biomed Online*. 2013;27(1):96–103. https://doi.org/10.1016/j.rbmo.2013.03.004.
34. Parton C, Ussher JM, Perz J. Hope, burden or risk: a discourse analytic study of the construction and experience of fertility preservation in the context of cancer. *Psychol Health*. 2019;34(4):456–477. https://doi.org/10.1080/08870446.2018.1543764.
35. Panagiotopoulou N, Ghuman N, Sandher R, Herbert M, Stewart JA. Barriers and facilitators towards fertility preservation care for cancer patients: a meta-synthesis. *Eur J Cancer Care*. 2018;27(1). https://doi.org/10.1111/ecc.12428.
36. Armuand GM, Wettergren L, Rodriguez-Wallberg KA, Lampic C. Women more vulnerable than men when facing risk for treatment-induced infertility: a qualitative study of young adults newly diagnosed with cancer. *Acta Oncol*. 2015;54(2):243–252. https://doi.org/10.3109/0284186X.2014.948573.
37. Covelli A, Facey M, Kennedy E, et al. Clinicians' perspectives on barriers to discussing infertility and fertility preservation with young women with cancer. *JAMA Netw Open*. 2019;2(11):e1914511. https://doi.org/10.1001/jamanetworkopen.2019.14511.
38. Campbell AG, Hillemeier M. Fertility counseling information adequacy as a moderator of regret among adolescent and young adult breast cancer survivors. *Support Care Cancer*. 2021;29(5):2689–2697. https://doi.org/10.1007/s00520-020-05771-9.
39. Berg M, Baysal Ö, Nelen W, Braat D, Beerendonk C, Hermens R. Professionals' barriers in female oncofertility care and strategies for improvement. *Hum Reprod*. 2019;34(6):1074–1082. https://doi.org/10.1093/humrep/dez062.
40. Ehrbar V, Urech C, Rochlitz C, et al. Randomized controlled trial on the effect of an online decision aid for young female cancer patients regarding fertility preservation. *Hum Reprod*. 2019;34(9):1726–1734. https://doi.org/10.1093/humrep/dez136.

41. van den Berg M, Nadesapillai S, Braat D, Hermens R, Beerendonk C. Fertility navigators in female oncofertility care in an academic medical center: a qualitative evaluation. *Support Care Cancer*. 2020;28(12):5733–5741. https://doi.org/10.1007/s00520-020-05412-1.
42. Garvelink MM, Ter Kuile MM, Louwe LA, Hilders C, Stiggelbout AM. Feasibility and effects of a decision aid about fertility preservation. *Hum Fertil*. 2017;20(2):104–112. https://doi.org/10.1080/14647273.2016.1254821.
43. Zwingerman R, Melenchuk K, McMahon E, et al. Expanding urgent oncofertility services for reproductive age women remote from a tertiary level fertility centre by use of telemedicine and an on-site nurse navigator. *J Cancer Educ*. 2020;35(3):515–521. https://doi.org/10.1007/s13187-019-01490-w.
44. Salsman JM, Yanez B, Snyder MA, et al. Attitudes and practices about fertility preservation discussions among young adults with cancer treated at a comprehensive cancer center: patient and oncologist perspectives. *Support Care Cancer*. 2021;29(10):5945–5955. https://doi.org/10.1007/s00520-021-06158-0.