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Oncofertility: fertility preservation in women undergoing oncologic treatments - narrative review

Carolina Flatschart Gerardi¹, Felipe Favorette Campanharo²

¹Medical Student, Santo Amaro University, São Paulo, SP, Brazil.

²Professor, Santo Amaro University, São Paulo, SP, Brazil.

ABSTRACT

OBJECTIVE

To analyze the main fertility preservation strategies indicated for women undergoing oncologic treatment, with emphasis on the recommendations of recent international guidelines.

METHODS

This is a narrative, qualitative, and descriptive review conducted through a search of the PubMed database between 2024 and 2025, using the descriptor “cancer fertility preservation.” Articles published in English with full-text availability that addressed oncofertility in women of reproductive age were included. Duplicate publications, studies unrelated to fertility preservation, pediatric studies, editorials, letters to the editor, isolated case reports, and articles without full-text access were excluded.

RESULTS

Guidelines recommend that women with cancer receive early counseling regarding reproductive risks and be referred to specialists before the initiation of oncologic treatment. Oocyte and embryo cryopreservation remain the most established strategies; however, there is still no consensus on the optimal approach. Ovarian suppression and ovarian tissue cryopreservation show limited evidence, particularly regarding long-term outcomes, reinforcing the need for a multidisciplinary approach.

CONCLUSION

Oncofertility integrates oncology and assisted reproduction, offering strategies to preserve fertility in women undergoing cancer treatment. Although oocyte cryopreservation is considered the most appropriate technique, further studies are needed to define the optimal approach, highlighting the importance of management by specialized multidisciplinary teams.

KEYWORDS

Oncofertility; Fertility preservation; Cancer.

Corresponding author

Carolina Flatschart Gerardi

Santo Amaro University

Rua Professor Eneas de Siqueira Neto, 340. Jardim das Imbuías, São Paulo, São Paulo, Brazil

E-mail: carolflats@gmail.com

ORCID: <https://orcid.org/0009-0004-8198-6074>

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INTRODUCTION

Advances in oncologic treatment have significantly increased survival among women of reproductive age, making fertility preservation an essential component of comprehensive cancer care.

Cancer is characterized by uncontrolled cell proliferation with the potential to invade surrounding tissues and distant organs. Its development results from genetic alterations (such as BRCA1 and BRCA2 gene mutations, which are associated with breast and ovarian cancers due to impaired DNA repair mechanisms) as well as environmental factors.^{1,2}

Cancer treatments, including chemotherapy, radiotherapy, surgery (hysterectomy and oophorectomy), hormone therapy, targeted therapy, or immunotherapy, may compromise female fertility, as they affect reproductive capacity by damaging oocytes, removing reproductive organs, or leading to irreversible ovarian insufficiency.³

After completion of oncologic treatment, when clinically feasible, it is recommended to wait between six months and two years before attempting pregnancy. This applies both to natural conception and assisted reproduction techniques, due to the risk of cancer recurrence.³

Once cured and desiring motherhood, women may resort to assisted reproductive technologies such as in vitro fertilization (IVF).³

In Brazil, the most incident neoplasms in women include breast cancer (30,1%) and gynecological cancers, such as cervical cancer (7,0%), ovarian cancer (3,0%), and endometrial/uterine body cancer (3,2%).⁴

Women are born with a finite number of follicles containing oocytes, which undergo maturation and are released during ovulation from intrauterine life until menopause.⁵ When combined with a cancer diagnosis, raises concerns – especially among women of reproductive age – regarding the risk of infertility following oncologic treatments. However, oncofertility has emerged as a viable option for fertility preservation in these patients.⁶

Oncofertility is the field of medicine that integrates oncology with assisted reproduction, enabling both male and female patients to preserve their fertility during cancer treatment. Fertility preservation can be achieved through oocyte cryopreservation, pharmacological suppression of ovarian function, ovarian tissue cryopreservation and ovarian transposition surgery.⁶ Additionally, embryo cryopreservation and gestational surrogacy may be considered in selected cases.⁷

Despite technological advances, access to oncofertility services remains unequal, particularly within public healthcare systems and in low-and middleincome countries, highlighting the need for studies that align international guidelines with the Brazilian healthcare reality.⁸

This study aims to contribute to the growing body of oncofertility research by emphasizing the importance of oocyte cryopreservation as a fertility preservation strategy and its potential to reduce infertility risk in cancer patients. Furthermore, it seeks to demonstrate that the most effective approach to preserving female fertility is oocyte cryopreservation prior to the initiation of oncologic treatment.

Thus, the general objective is to analyze the main oncofertility strategies for women undergoing oncologic treatment. The specific objectives include describing the impact of cancer treatments on ovarian reserve, presenting available fertility preservation techniques and identifying recent recommendations from international guidelines.

METHODS

Study Design

This is a narrative literature review developed using a qualitative and descriptive approach.

Literature Search

The study was conducted using articles exclusively selected from the PubMed database, covering the period from March 2024 to August 2025.

The descriptor used was: “cancer fertility preserva-

tion,” without the application of Boolean operators.

Study Selection (Inclusion and Exclusion Criteria)

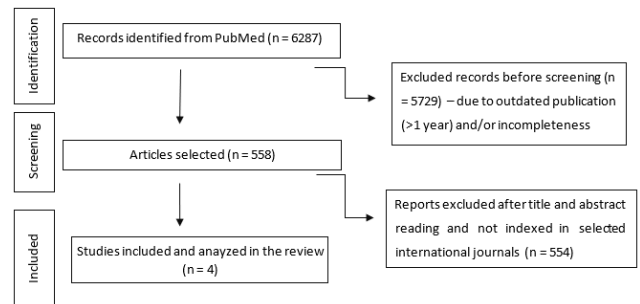
The variables considered included types of gynecological cancer, oncologic treatments that may compromise female fertility, women of reproductive age and oncofertility as a fertility preservation strategy.

The inclusion criteria comprised studies addressing oncofertility in women diagnosed with cancer, published in English, with full-text availability, and discussing fertility preservation strategies in the context of oncologic treatment. Articles unrelated to fertility preservation, duplicate publications and studies whose primary focus did not include women of reproductive age were initially excluded. After screening titles and abstracts, pediatric studies, editorials, letters to the editor, isolated case reports and publications without full-text access were also excluded.

Data Extraction and Organization

Data extraction was performed in PubMed using the search expression “cancer fertility preservation,” yielding a total of 6287 articles, which were analyzed based on publication year and free full-text access. Subsequently, these articles were screened according to titles, abstracts and indexing in highimpact international scientific journals, as illustrated in figure 1.

Figure 1- Selection of scientific articles.



Source: The authors.

Data Analysis and Synthesis

Selected articles were presented in a table including the following variables: authors, year, title and conclusion (Table 1).

RESULTS

Table 1- Selected articles according to authors, year, title and conclusion.

Authors	Year	Title	Conclusion
Su et al. ⁹	2025	Fertility Preservation in People With Cancer: ASCO Guideline Update.	Patients diagnosed with cancer should be evaluated and counseled regarding reproductive risks and referred to reproductive specialists before oncologic therapy.
Eden et al. ⁸	2024	Cancer Therapy, Gonadal Function, and Fertility Preservation: Narrative Review.	Due to limited research, further studies are needed to follow patients undergoing fertility preservation.
Witterings et al. ¹⁰	2025	Interventions for fertility preservation in women with cancer undergoing chemotherapy.	It is not yet possible to determine which strategy (controlled ovarian hyperstimulation with gonadotropins combined with protective agents followed by oocyte or embryo cryopreservation, or ovarian suppression using GnRH agonists) is most effective for preserving fertility in women with cancer undergoing chemotherapy.
Morice et al. ¹¹	2024	Fertility-sparing treatment and follow-up in patients with cervical cancer, ovarian cancer, and borderline ovarian tumours: guidelines from ESGO, ESHRE, and ESGE.	Guidelines emphasize multidisciplinary care and recommend oocyte or embryo cryopreservation as the main technique.

Source: The authors.

ASCO: American Society of Clinical Oncology.
GnRH: Gonadotropin releasing hormone.
ESGO: European Society of Gynecological Oncology.
ESHRE: European Society of Human Reproduction and Embryology.
ESGE: European Society for Gynaecological Endoscopy.

DISCUSSION

Impact of Oncologic Treatments on Ovarian Function

Oncologic treatments represent one of the main causes of impaired ovarian function in women of reproductive age. Chemotherapy, especially with alkylating agents such as cyclophosphamide, is associated with direct damage to ovarian follicles, accelerating ovarian reserve depletion and increasing the risk of premature ovarian insufficiency. Pelvic radiotherapy may cause irreversible injury to ovarian tissue, while surgical interventions such as oophorectomy and hysterectomy permanently eliminate the possibility of spontaneous pregnancy.⁸

Despite recognition of these risks, the magnitude of impact varies according to patient age, treatment type and dose, baseline ovarian reserve and the time available before initiation of antineoplastic therapy. This clinical heterogeneity reinforces the importance of individualized evaluation and early discussion of fertility preservation, preferably prior to the initiation of oncologic treatment.⁹

Fertility Preservation Strategies in Women with Cancer

Among the available fertility preservation strategies, oocyte and embryo cryopreservation are currently the most established techniques and are widely recommended by major international guidelines. The update from the American Society of Clinical Oncology strengthens that these techniques present a high level of evidence and a strong recommendation when performed prior to oncologic treatment. This update also highlights the feasibility of oocyte retrieval regardless of the phase of the menstrual cycle.⁸

Ovarian tissue cryopreservation represents a relevant alternative, particularly for prepubertal patients or in cases in which there is insufficient time for ovarian stimulation. However, despite its potential, this technique still presents limitations regarding oncologic safety and long-term reproductive outcomes and therefore remains indicated only in selected cases and specialized centers.^{8,11}

Ovarian suppression with gonadotropin releasing hormone (GnRH) agonists has been used as an adjuvant strategy during chemotherapy. Although some studies suggest a reduction in the incidence of chemotherapy induced ovarian insufficiency, evidence regarding its impact on pregnancy and live birth rates remains limited, justifying its conditional recommendation in current guidelines.^{8,10}

Evidence Gaps and Lack of Consensus

Although oocyte cryopreservation is frequently described as the most appropriate fertility preservation strategy, there is no universal consensus regarding the optimal approach for all patients. This apparent contradiction arises because the choice of technique depends on multiple factors, including cancer type, patient age, ovarian reserve, time available before treatment initiation and oncologic prognosis.¹⁰

Moreover, the literature lacks robust reproductive outcome data, particularly live birth rates and long-term follow-up data. Methodological heterogeneity and the absence of direct comparative clinical trials among different fertility preservation strategies limit interpretation of available evidence and hinder definitive conclusions, underscoring the need for prospective studies with extended follow-up.^{9,10}

Access, Equity and Multidisciplinary Approach: A Global Health Perspective

In spite of technical advances in the field of oncofertility, access to fertility preservation strategies remains unequal. Barriers such as high costs, lack of insurance coverage, limited availability of specialized services and the short interval between diagnosis and initiation of oncologic treatment hinder implementation of these techniques, notably in public healthcare systems and in low- and middle-income countries.⁹

In addition to structural barriers, social, cultural and ethical factors influence decision-making, especially in young

women, those without partners or those with a poor prognosis. Issues related to informed consent, fertility preservation in minors and the psychological impact of a cancer diagnosis further reinforce the importance of a patient-centered approach.⁹

In this context, international guidelines emphasize the necessity for an integrated multidisciplinary approach involving oncologists, assisted reproduction specialists and other healthcare professionals to ensure that fertility preservation discussions occur early, ethical, and in alignment with each patient's clinical and social circumstances.^{8,11}

CONCLUSION

In light of the evidence reviewed, oncofertility can be understood as an interdisciplinary field that integrates oncology and assisted reproductive technologies, enabling fertility preservation in women undergoing oncologic treatment through different strategies, such as oocyte, embryo and ovarian tissue cryopreservation, along with adjuvant approaches. The literature review demonstrates that oocyte and embryo cryopreservation represent the most established techniques and are widely recommended by current international guidelines.

Nevertheless, the choice of optimal strategy should be individualized, taking into account clinical, oncologic and social factors, as significant evidence gaps still exist, particularly regarding long-term reproductive outcomes. Besides, barriers related to access, cost and availability of specialized services reinforce the need for a equitable and multidisciplinary approach, aligned with healthcare system realities, specifically in low- and middle-income countries.

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