

## PERSPECTIVE ARTICLE

Addressing the psychological impact of  
infertility risk arising from breast cancer  
treatment: Education and self-compassion  
interventionsRory D. Colman<sup>1†\*</sup>  and Yasuhiro Kotera<sup>2†</sup> <sup>1</sup>College of Health, Psychology and Social Care, University of Derby, Derby, Derbyshire, United Kingdom<sup>2</sup>School of Health Sciences, University of Nottingham, Nottingham, Nottinghamshire, United Kingdom**Abstract**

Breast cancer incidence is increasing globally, including populations of childbearing age. Infertility risk from cancer treatment can negatively impact mental health in breast cancer patients and survivors, in part due to a lack of understanding of the risk and mitigation options ahead of treatment. In this commentary, recent literature on understanding of breast cancer treatment risk to infertility is reviewed, and recommendations are made for improving knowledge for at-risk populations. In addition, we propose a novel integration of self-compassion interventions be applied within breast cancer clinical care, building on groundwork from both breast cancer and primary infertility research areas that indicate the psychological benefits of self-compassion. Considerations for the application of self-compassion interventions to address fertility concerns within breast cancer patient and survivor populations are discussed.

**Keywords:** Breast cancer; Breast cancer understanding; Infertility; Reproductive health; Self-compassion; Mental health

†These authors contributed equally to this work.

**\*Corresponding author:**Rory D. Colman  
(r.colman@derby.ac.uk)

**Citation:** Colman, R.D., & Kotera, Y. (2024). Addressing the psychological impact of infertility risk arising from breast cancer treatment: Education and self-compassion interventions. *International Journal of Population Studies*.  
<https://doi.org/10.36922/ijps.1724>

**Received:** August 30, 2023

**Accepted:** May 20, 2024

**Published Online:** July 17, 2024

**Copyright:** © 2024 Author(s). This is an Open-Access article distributed under the terms of the Creative Commons Attribution License, permitting distribution, and reproduction in any medium, provided the original work is properly cited.

**Publisher's Note:** AccScience Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**1. Introduction**

It is the purpose of this perspective article to offer a commentary of prevailing knowledge regarding understanding of infertility risk following breast cancer treatment and suggest potential interventions to help breast cancer patients and survivors cope with the psychological impacts of this risk. These include improving access to fertility preservation information ahead of treatment and offering a self-compassion intervention as adjunct to cancer treatment.

Breast cancer is the leading cause of cancer-related death in females across the lifespan (Cardoso *et al.*, 2019). Incidence is increasing in many phases of women's lives. Between 25% and 55% of total breast cancer diagnoses occur in pre-menopausal females, depending on the geographical regions (Paluch-Shimon *et al.*, 2022). In recent reviews of breast cancer understanding amongst the general population (Wang *et al.*, 2022) and university students internationally (Colman *et al.*, 2023), a marked lack of

awareness and knowledge of breast cancer prevalence, its symptoms, screening, and treatments have been found. Within this commentary, we suggest that information on the impact of breast cancer treatment be incorporated in breast cancer educational interventions, delivered to the general population, students, or those diagnosed with breast cancer. The inclusion of this information will ensure those at risk of developing breast cancer or undergoing treatment can make informed choices of how best to safeguard their quality of life and mental well-being. In particular, infertility risk is greatly heightened for those receiving cancer treatment (Silvestris *et al.*, 2020). Though mitigations can be implemented, these approaches are clinical and require medical advice to inform choice.

Infertility is a strong risk factor for psychopathologies such as depression (Kiani *et al.*, 2021) and anxiety (Yusuf, 2016). Pre-menopausal breast cancer survivors are at particular risk of depression due to reproduction-related concerns (Gorman *et al.*, 2015). Since self-compassion interventions have been found to promote mental health for breast cancer patients (Haj Sadeghi *et al.*, 2018; Pinto-Gouveia *et al.*, 2014) and those experiencing primary infertility (Hajhasani & Ekhtiari Amiri, 2023; Hoyle *et al.*, 2022), we suggest incorporating it as a promising intervention for protecting the mental health of those diagnosed with breast cancer who are family-planning.

## 2. Breast cancer treatment, infertility risk, educational intervention, and psychological impact

### 2.1. Breast cancer treatment as a risk for infertility

Breast cancer treatment options include administration of gonadotoxic drugs, that is, those which can damage reproductive organs, and radiation; each of which carry a high risk of impairing ovarian function (Paluch-Shimon *et al.*, 2022). Silvestris *et al.* (2020) reported that cancer treatment results in permanent infertility for over one-third of breast cancer patients. Although approximately half of young breast cancer patients report wishing to pursue pregnancy post-treatment, their chance is reduced by between 40% and 60% in comparison to the general population (Marklund *et al.*, 2021). This heightened risk can be mitigated through a number of strategies, such as egg (oocyte) and embryo preservation (Gullo *et al.*, 2022), though all must be implemented ahead of cancer treatment and are complicated in some cases by exacerbation of the cancer risk itself (Silvestris *et al.*, 2020).

Developments in preventative treatment for breast cancer, using myo-inositol-based supplements, have shown clinical benefit (Pasta *et al.*, 2015). Since myo-inositol

supplement has also been shown to improve reproductive outcomes (Mohammadi *et al.*, 2021), such a treatment holds significant promise for young breast cancer patients but may not be commonly available. Assisted reproductive technologies have been found not to be associated with neurodevelopmental diseases (Gullo *et al.*, 2022), and non-invasive screening for pathology during gestation is commonly applied (Gullo *et al.*, 2023), improving fertility outcomes.

Recent understanding of the role of microRNAs in breast cancer etiology will lead to improvements in diagnosis, with potential for elevated rates of early diagnosis and survival (Piergentili *et al.*, 2024). With the advent of artificial intelligence-assisted fertility assessment, improvements in fertility rates are expected in this population despite the impact of cancer treatment (Medenica *et al.*, 2022). Taken together, this evidence indicates a complex and changing informational environment for the clinician and patient to navigate when considering fertility preservation.

### 2.2. Improving education regarding the fertility impact of breast cancer treatment

Despite fertility preservation techniques being accessible in industrialized nations, Schover *et al.* (2014) identified that these were underutilized, and many cancer patients were not informed of their availability. Roberts *et al.* (2015) cite the lack of clinician knowledge, inadequate resources, and misperceptions regarding intervention costs and efficacy as barriers to accessing fertility preservation techniques. Furthermore, highlighted by Roberts *et al.* (2015) are the challenges posed by the psychological impact of receiving a cancer diagnosis on a patient's ability to make informed fertility decisions, and the complex ethical implications of the various preservation options. A study by Zaami *et al.* (2022a) showed a decline in fertility counseling rates for cancer patients since the COVID-19 pandemic. Reviews of extant literature on breast cancer patients' information needs, particularly relating to fertility, reveal that, in the last 15 years, little has improved. Peate *et al.* (2009) concluded that patients' needs and concerns regarding fertility and menopause were often not adequately addressed or discussed before commencing breast cancer treatment. This finding was echoed more recently by Martino *et al.* (2021), who highlighted that as many as 25% of women were not aware of disease or treatment impacts on fertility at the time of diagnosis.

The European Society of Human Reproduction and Embryology Guideline Group on Female Fertility Preservation (ESHRE) (2020) strongly recommended the crucial provision of fertility information by clinicians and fertility counselors to young women diagnosed

with cancer. Fertility counseling must align to available resources and legislation per setting to ensure information on procedures is relevant (Zaami *et al.*, 2022b). In line with the latest guidance of the European School of Oncology (ESO) and the European Society of Medical Oncology (ESMO) (Paluch-Shimon *et al.*, 2022), enhancing clinician, patient, and general population knowledge of cancer treatment fertility impact and mitigation options is therefore recommended. General breast cancer educational interventions and targeted clinical work with patients are each indicated to achieve these aims.

### **2.3. Psychological impacts of breast cancer and infertility**

#### **2.3.1. Psychological impact of breast cancer and treatment**

The effects of cancer and cancer treatments are well-documented as having a serious negative impact on psychological well-being (Niedzwiedz *et al.*, 2019). Depression, in particular, is seen to have interactive effects with cancer that can inhibit treatment adherence and worsen outcomes (Pinto-Gouveia *et al.*, 2014). Reviewing the breast cancer-specific literature, Dinapoli *et al.* (2021) identify anxiety, distress, post-traumatic stress disorder, and depression as highly prevalent in breast cancer patients. Since findings indicate that psychopathology can, in addition, independently impact on fertility owing to deleterious influence on the endocrine and nervous system (Szkodziak *et al.*, 2020), the psychological impact of breast cancer exacerbates reproductive health problems.

#### **2.3.2. Psychological impact of infertility**

Infertility's impact on psychological well-being itself has understandably received much research attention. Kiani *et al.* (2021) have recently systematically reviewed the literature and determined that infertile women were significantly more depressed than the general population of a given country. This effect was particularly pronounced in low- to middle-income countries. In addition to depression, anxiety and stress have been found to be higher in infertile females than in the general population (Yusuf, 2016).

#### **2.3.3. Psychological impact of infertility on breast cancer survivors**

By exploring empirical work on the specific psychological impact of fertility concerns among breast cancer survivors, we found that treatment-related fertility risk evokes the same level of emotional distress and arousal in young non-cancer infertile females, though accompanied by worse perceived health-related quality of life (Bártolo *et al.*, 2020). After investigating the reproduction concerns of

200 young breast cancer survivors (18 – 35 years of age), Gorman *et al.* (2015) identified strong associations between reproduction concerns and depression risk, corroborating the findings of Howard-Anderson *et al.*'s (2012) systematic review, which found that depression risk was heightened in breast cancer survivors due to reproduction concerns and that these concerns were common. Synthesized qualitative findings also support this link, and shed light on the lived experience of breast cancer survivors' fertility concerns, with reports that loss of fertility is viewed as the biggest post-treatment regret (Campbell-Enns & Woodgate, 2017). Grief over fertility loss in breast cancer patients is identified as a common theme (Ussher & Perz, 2019). Such grief over lost possibilities threatens identity and meaning for breast cancer patients (Carr *et al.*, 2023), which is detrimental to psychological functioning (Gilbert, 2022).

### **3. Compassion interventions for breast cancer patients and survivors**

#### **3.1. Self-compassion is protective against breast cancer-related psychological impact**

One important psychological factor that has been shown to protect against depression, and other psychopathologies related to illness, is self-compassion (Pinto-Gouveia *et al.*, 2014). Self-compassion is the ability to recognize one's suffering and respond to alleviate the suffering with supportive self-reassuring (Gilbert, 2009). Self-compassion is commonly conceptualized as comprising components of self-kindness (vs. self-judgment), common humanity (vs. isolation), and mindfulness (vs. over-identification with thoughts) (Neff, 2023). Self-compassion activates neurophysiological systems that regulate motivation, emotion, and behavior, toward a soothing, rather than threat-based, orientation (Gilbert, 2014). In this way, self-compassion counters shame and self-criticism, which are shown to be linked with mental health problems in breast cancer patients (Connolly-Zubot *et al.*, 2020). Self-compassion is positively associated with many positive mental health outcomes, such as resilience and well-being (Kotera *et al.*, 2021; Kotera *et al.*, 2022b), and is negatively associated with many negative mental health outcomes, such as shame and depression (Colman *et al.*, 2022; Kotera *et al.*, 2022a), with longitudinal benefits for cancer patients (Zhu *et al.*, 2019). Pinto-Gouveia *et al.* (2014) found self-compassion to be the only significant predictor of lower depression and higher quality of life within a mixed cancer cohort, which included 46% of breast cancer patients. Haj Sadeghi *et al.* (2018) demonstrated, through randomized controlled trial, that compassion-focused therapy, which emphasizes self-compassion, significantly reduced depression and anxiety in breast cancer patients. Todorov

*et al.* (2019) reported that self-compassion was protective for a range of psychological well-being self-report measures in 195 breast cancer survivors. Self-compassion has also been demonstrated to moderate stress and protect self-care behaviors, which are important for recovery post-treatment for breast cancer survivors (Abdollahi *et al.*, 2020).

### 3.2. Self-compassion is protective against infertility-related psychological impact

Self-compassion is also protective for infertile females. Hoyle *et al.* (2022) found that self-compassion is a protective factor against psychological distress in women in the U.S. experiencing infertility. This finding has recently been replicated in an Iranian study by Hajihassani & Ekhtiari Amiri (2023). These findings suggested that self-compassion may protect women from psychological distress derived from infertility. As Gilbert (2022) has outlined, self-compassion enables those experiencing grief at lost possibilities, such as infertility, to approach the complex arising emotions from a foundation of courage, protected against self-blame (Uneno *et al.*, 2022; Young & Kotera, 2022). Such psychological resourcing may explain the benefits of self-compassion within this population.

### 3.3. Proposal for integrative self-compassion interventions within breast cancer care

Psychological adjuncts to cancer treatment have been shown to lead to improved outcomes for patients when delivered before cancer treatment (Chen & Ahmad, 2018). We propose a novel integration of self-compassion interventions be applied within breast cancer clinical care, building on groundwork from both breast cancer and primary infertility research areas, since (a) self-compassion is found to be a protective factor for breast cancer and primary infertility populations independently, and (b) evidence suggests that the distressing experiences of each of these populations mirrors each other (Bártolo *et al.*, 2020). This intervention would seek to alleviate the psychological harm infertility risk related to breast cancer treatment may cause, or has caused, while concomitantly developing inner coping resources translatable to other life domains. To form an impression of what this intervention integration might offer, we can draw on recent intervention findings from each independent context. Systematic review and meta-analysis of compassion-based intervention trials for breast cancer patients (Fan *et al.*, 2023) show that self-compassion is enhanced and depression reduced regardless of delivery mediums, either in-person or web-based, with the strongest effects found for extended interventions (4–12 weeks) rather than brief interventions (30 min). Similarly, Njogu *et al.* (2023) found that both video and digital story self-compassion interventions were effective

in reducing anxiety and depression and increasing self-compassion for women pursuing fertility treatment.

To improve the efficacy of compassion-focused therapy interventions with cancer patients Wei *et al.* (2023) identified self-compassion profiles that influence treatment outcome, recommending that interventions be tailored to match the individual's particular self-compassion profile. We, therefore, suggest that any compassion-based interventions be mindful of these profiles and tailor content to the individual as far as practical. Intervention coordinators must consider which practices to implement, as not all may be appropriate in cancer survivors, and some common self-compassion exercises, such as body scanning, could cause further distress (Lathren *et al.*, 2018).

## 4. Conclusion

The outcome of this propositional commentary based on the synthesis of literature from breast cancer and fertility research is a set of three specific recommendations.

First, further to the latest guidance from the ESO-ESMO (Paluch-Shimon *et al.*, 2022), we recommend that cancer treatment impact to fertility for pre-menopausal females be included within all breast cancer educational interventions. Consideration of inclusion of such information should be given to existing information campaigns as well as prospective campaigns. Appropriate messaging per audience should be determined through trials. The existing information leaflet template provided by ESHRE (2020) should be considered as a resource for such interventions.

Second, based on the foregoing review, we recommend that a self-compassion intervention addressing the specific reproduction concerns of young breast cancer patients and survivors be developed and implemented within a multidisciplinary care team. For maximum efficacy, the intervention should commence ahead of cancer treatment (Chen & Ahmad, 2018), account for individual self-compassion profiles (Wei *et al.*, 2023), and persist for a minimum of 4 weeks (Fan *et al.*, 2023). Delivery may be in-person or internet-mediated (Fan *et al.*, 2023), and can make use of innovations in therapeutic aids, such as digital storytelling (Njogu *et al.*, 2023).

Finally, it must be acknowledged that for young breast cancer patients and survivors, a measure of grief is associated with fertility loss (Campbell-Enns & Woodgate, 2017), indicating that this may be a crucial element of the individual experience that must be sensitively supported through any planned intervention.

## Acknowledgments

None.



## Funding

None.

## Conflict of interest

The authors declare they have no competing interests.

## Author contributions

*Conceptualization:* Yasuhiro Kotera

*Writing – original draft:* Rory D. Colman

*Writing – review & editing:* All authors

## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable.

## Availability of data

Not applicable.

## References

- Abdollahi, A., Taheri, A., & Allen, K.A. (2020). Self-compassion moderates the perceived stress and self-care behaviors link in women with breast cancer. *Psychooncology*, 29(5):927-933. <https://doi.org/10.1002/pon.5369>
- Bártolo, A., Neves, M., Carvalho, B., Reis, S., Valério, E., Santos, I.M., et al. (2020). Fertility under uncertainty: Exploring differences in fertility-related concerns and psychosocial aspects between breast cancer survivors and non-cancer infertile women. *Breast Cancer*, 27(6):1177-1186. <https://doi.org/10.1007/s12282-020-01124-w>
- Campbell-Enns, H.J., & Woodgate, R.L. (2017). The psychosocial experiences of women with breast cancer across the lifespan: A systematic review. *Psychooncology*, 26(11):1711-1721. <https://doi.org/10.1002/pon.4281>
- Cardoso, F., Kyriakides, S., Ohno, S., Penault-Llorca, F., Poortmans, P., Rubio, I.T., et al. (2019). Early breast cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Annals of Oncology*, 30(8):1194-1220. <https://doi.org/10.1093/annonc/mdz173>
- Carr, A.L., Roberts, S., Bonnell, L.N., & Kolva, E. (2023). Existential distress and meaning making among female breast cancer patients with cancer-related fertility concerns. *Palliative and Supportive Care*, 21(2):196-204. <https://doi.org/10.1017/S1478951522001675>
- Chen, Y., & Ahmad, M. (2018). Effectiveness of adjunct psychotherapy for cancer treatment: A review. *Future Oncology*, 14(15):1487-1496. <https://doi.org/10.2217/fon-2017-0671>
- Colman, R., Kirkman, A., Jackson, J., Golbourn, L., Ozaki, A., & Kotera, Y. (2023). Breast cancer understanding among university students: A rapid review of cross-country comparisons. *Archives of Breast Cancer*, 10(2):114-123. <https://doi.org/10.32768/abc.2023102114-123>
- Colman, R.D., Vione, K.C., & Kotera, Y. (2022). Psychological risk factors for depression in the UK general population: Derailment, self-criticism and self-reassurance. *British Journal of Guidance and Counselling*, 52(4):1-18. <https://doi.org/10.1080/03069885.2022.2110214>
- Connolly-Zubot, A., Timulak, L., Hession, N., & Coleman, N. (2020). Emotion-focused therapy for anxiety and depression in women with breast cancer. *Journal of Contemporary Psychotherapy*, 50(2):113-122. <https://doi.org/10.1007/s10879-019-09439-2>
- Dinapoli, L., Colloca, G., Di Capua, B., & Valentini, V. (2021). Psychological aspects to consider in breast cancer diagnosis and treatment. *Current Oncology Reports*, 23(3):38. <https://doi.org/10.1007/s11912-021-01049-3>
- ESHRE Guideline Group on Female Fertility Preservation, Anderson, R.A., Amant, F., Braat, D., D'Angelo, A., Chuva de Sousa Lopes, S.M., et al. (2020). ESHRE guideline: Female fertility preservation†. *Human Reproduction Open*, 2020(4):hoaa052. <https://doi.org/10.1093/hropen/hoaa052>
- Fan, Y.C., Hsiao, F.H., & Hsieh, C.C. (2023). The effectiveness of compassion-based interventions among cancer patients: A systematic review and meta-analysis. *Palliative and Supportive Care*, 21(3):534-546. <https://doi.org/10.1017/S1478951522001316>
- Gilbert, P. (2009). *The Compassionate Mind: A New Approach to Life's Challenges*. United States: Robinson. Available from: <https://lib.ugent.be/catalog/rug01:002040613>
- Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, 53(1):6-41. <https://doi.org/10.1111/bjc.12043>
- Gilbert, P. (2022). An evolutionary and compassion-based approach to yearning and grief. In: Harris, D., & Ho, A. (eds.). *Compassion-Based Approaches in Loss and Grief*. England, UK: Routledge, p.18-27. <https://doi.org/10.4324/9781003204121-4>
- Gorman, J.R., Su, H.I., Roberts, S.C., Dominick, S.A., & Malcarne, V.L. (2015). Experiencing reproductive concerns as a female cancer survivor is associated with depression. *Cancer*, 121(6):935-942. <https://doi.org/10.1002/cncr.29133>
- Gullo, G., Perino, A., & Cucinella, G. (2022). Open vs. closed

- vitrification system: Which one is safer? *European Review for Medical and Pharmacological Sciences*, 26(4):1065-1067.  
[https://doi.org/10.26355/eurrev\\_202202\\_28092](https://doi.org/10.26355/eurrev_202202_28092)
- Gullo, G., Scaglione, M., Buzzaccarini, G., Laganà, A.S., Basile, G., Chiantera, V., *et al.* (2023). Cell-free fetal DNA and Non-invasive prenatal diagnosis of chromosomopathies and pediatric monogenic diseases: A critical appraisal and medicolegal remarks. *Journal of Personalized Medicine*, 13(1):1.
- Gullo, G., Scaglione, M., Cucinella, G., Perino, A., Chiantera, V., D'Anna, R., *et al.* (2022). Impact of assisted reproduction techniques on the neuro-psycho-motor outcome of newborns: A critical appraisal. *Journal of Obstetrics and Gynaecology*, 42(7):2583-2587.  
<https://doi.org/10.1080/01443615.2022.2109953>
- Haj Sadeghi, Z., Yazdi-Ravandi, S., & Pirnia, B. (2018). Compassion-focused therapy on levels of anxiety and depression among women with breast cancer: A randomized pilot trial [Research Article]. *International Journal of Cancer*, 11(11):e67019.  
<https://doi.org/10.5812/ijcm.67019>
- Hajihassani, M., & Ekhtiari Amiri, R. (2023). Psychological distress in infertile women: The role of quality of marital relationships and self-compassion. *Human Fertility*, 26:1-7.  
<https://doi.org/10.1080/14647273.2023.2222547>
- Howard-Anderson, J., Ganz, P.A., Bower, J.E., & Stanton, A.L. (2012). Quality of life, fertility concerns, and behavioral health outcomes in younger breast cancer survivors: A systematic review. *JNCI: Journal of the National Cancer Institute*, 104(5):386-405.  
<https://doi.org/10.1093/jnci/djr541>
- Hoyle, R.H., Davison, E.K., & Novice, M.L. (2022). Relations between protective traits and psychological distress among women experiencing infertility. *Journal of Health Psychology*, 27(2):397-407.  
<https://doi.org/10.1177/1359105320953466>
- Kiani, Z., Simbar, M., Hajian, S., & Zayeri, F. (2021). The prevalence of depression symptoms among infertile women: A systematic review and meta-analysis. *Fertility Research and Practice*, 7(1):6.  
<https://doi.org/10.1186/s40738-021-00098-3>
- Kotera, Y., Cockerill, V., Chircop, J., Kaluzeviciute, G., & Dyson, S. (2021). Predicting self-compassion in UK nursing students: Relationships with resilience, engagement, motivation, and mental wellbeing. *Nurse Education in Practice*, 51:102989.  
<https://doi.org/10.1016/j.nepr.2021.102989>
- Kotera, Y., Kotera, H., Taylor, E., Wilkes, J., Colman, R., & Riswani, R. (2022a). Mental health of Indonesian university students: U.K. comparison and relationship between mental health shame and self-compassion. *Stigma and Health*. Advance online publication.  
<https://doi.org/10.1037/sah0000420>
- Kotera, Y., Maybury, S., Liu, G., Colman, R., Lieu, J., & Dosedlová, J. (2022b). Mental well-being of Czech University students: Academic motivation, self-compassion, and self-criticism. *Healthcare (Basel)*, 10(11):2135.  
<https://doi.org/10.3390/healthcare10112135>
- Lathren, C., Bluth, K., Campo, R., Tan, W., & Futch, W. (2018). Young adult cancer survivors' experiences with a mindful self-compassion (MSC) video-chat intervention: A qualitative analysis. *Self and Identity*, 17(6):646-665.  
<https://doi.org/10.1080/15298868.2018.1451363>
- Marklund, A., Lundberg, F.E., Eloranta, S., Hedayati, E., Pettersson, K., & Rodriguez-Wallberg, K.A. (2021). Reproductive outcomes after breast cancer in women with vs without fertility preservation. *JAMA Oncology*, 7(1):86-91.  
<https://doi.org/10.1001/jamaoncol.2020.5957>
- Martino, M.L., Lemmo, D., & Gargiulo, A. (2021). A review of psychological impact of breast cancer in women below 50 years old. *Health Care for Women International*, 42(7-9):1066-1085.  
<https://doi.org/10.1080/07399332.2021.1901901>
- Medenica, S., Zivanovic, D., Batkoska, L., Marinelli, S., Basile, G., Perino, A., *et al.* (2022). The future is coming: Artificial intelligence in the treatment of infertility could improve assisted reproduction outcomes-the value of regulatory frameworks. *Diagnostics (Basel)*, 12(12):2979.  
<https://doi.org/10.3390/diagnostics12122979>
- Mohammadi, S., Eini, F., Bazarganipour, F., Taghavi, S.A., & Kutenaee, M.A. (2021). The effect of Myo-inositol on fertility rates in poor ovarian responder in women undergoing assisted reproductive technique: A randomized clinical trial. *Reproductive Biology and Endocrinology*, 19(1):61.  
<https://doi.org/10.1186/s12958-021-00741-0>
- Neff, K.D. (2023). Self-compassion: Theory, method, research, and intervention. *Annual Review of Psychology*, 74(1):193-218.  
<https://doi.org/10.1146/annurev-psych-032420-031047>
- Niedzwiedz, C.L., Knifton, L., Robb, K.A., Katikireddi, S.V., & Smith, D.J. (2019). Depression and anxiety among people living with and beyond cancer: A growing clinical and research priority. *BMC Cancer*, 19(1):943.  
<https://doi.org/10.1186/s12885-019-6181-4>
- Njogu, A., Kaburu, F., Njogu, J., Barasa, E., Mutisya, A., & Luo, Y. (2023). The effect of self-compassion-based programs for infertility (SCPI) on anxiety and depression among women pursuing fertility treatment: A three-armed, randomised controlled trial. *Journal of Assisted Reproduction and Genetics*, 40(4):911-927.

<https://doi.org/10.1007/s10815-023-02771-6>

Paluch-Shimon, S., Cardoso, F., Partridge, A.H., Abulkhair, O., Azim, H.A., Bianchi-Micheli, G., *et al.* (2022). ESO-ESMO fifth international consensus guidelines for breast cancer in young women (BCY5). *Annals of Oncology*, 33(11):1097-1118.

<https://doi.org/10.1016/j.annonc.2022.07.007>

Pasta, V., Gullo, G., Giuliani, A., Harrath, A.H., Alwasel, S.H., Tartaglia, F., *et al.* (2015). An association of *Boswellia*, betaine and myo-inositol (Eumastós) in the treatment of mammographic breast density: A randomized, double-blind study. *European Review for Medical and Pharmacological Sciences*, 19(22):4419-4426.

Peate, M., Meiser, B., Hickey, M., & Friedlander, M. (2009). The fertility-related concerns, needs and preferences of younger women with breast cancer: A systematic review. *Breast Cancer Research and Treatment*, 116(2):215-223.

<https://doi.org/10.1007/s10549-009-0401-6>

Piergentili, R., Marinelli, E., Cucinella, G., Lopez, A., Napoletano, G., Gullo, G., *et al.* (2024). miR-125 in breast cancer etiopathogenesis: An emerging role as a biomarker in differential diagnosis, regenerative medicine, and the challenges of personalized medicine. *Non-Coding RNA*, 10(2):16.

<https://doi.org/10.3390/ncrna10020016>

Pinto-Gouveia, J., Duarte, C., Matos, M., & Fráguas, S. (2014). The protective role of self-compassion in relation to psychopathology symptoms and quality of life in chronic and in cancer patients. *Clinical Psychology and Psychotherapy*, 21(4):311-323.

<https://doi.org/10.1002/cpp.1838>

Roberts, J., Ronn, R., Tallon, N., & Holzer, H. (2015). Fertility preservation in reproductive-age women facing gonadotoxic treatments. *Current Oncology*, 22(4):294-304.

<https://doi.org/10.3747/co.22.2334>

Schover, L.R., Van der Kaaij, M., Van Dorst, E., Creutzberg, C., Huyghe, E., & Kiserud, C.E. (2014). Sexual dysfunction and infertility as late effects of cancer treatment. *European Journal of Cancer Supplements*, 12(1):41-53.

<https://doi.org/10.1016/j.ejcsup.2014.03.004>

Silvestris, E., Dellino, M., Cafforio, P., Paradiso, A.V., Cormio, G., & D'Oronzo, S. (2020). Breast cancer: An update on treatment-related infertility. *Journal of Cancer Research and Clinical Oncology*, 146(3):647-657.

<https://doi.org/10.1007/s00432-020-03136-7>

Szkodziak, F., Krzyżanowski, J., & Szkodziak, P. (2020). Psychological aspects of infertility. A systematic review. *Journal of International Medical Research*, 48(6):0300060520932403.

<https://doi.org/10.1177/0300060520932403>

Todorov, N., Sherman, K.A., Kilby, C.J., & Breast Cancer Network

Australia. (2019). Self-compassion and hope in the context of body image disturbance and distress in breast cancer survivors. *Psychooncology*, 28(10):2025-2032.

<https://doi.org/10.1002/pon.5187>

Uneno, Y., Kotera, Y., Fujisawa, D., Kataoka, Y., Kosugi, K., Murata, N., *et al.* (2022). Development of a novel compassion focused online psychotherapy for bereaved informal caregivers: The compact feasibility trial protocol. *BMJ Open*, 12(12):e067187.

<https://doi.org/10.1136/bmjopen-2022-067187>

Ussher, J.M., & Perz, J. (2019). Infertility-related distress following cancer for women and men: A mixed method study. *Psychooncology*, 28(3):607-614.

<https://doi.org/10.1002/pon.4990>

Wang, Y.J., Wang, F., Yu, L.X., Xiang, Y.J., Zhou, F., Huang, S.Y., *et al.* (2022). Worldwide review with meta-analysis of women's awareness about breast cancer. *Patient Education and Counseling*, 105(7):1818-1827.

<https://doi.org/10.1016/j.pec.2021.12.012>

Wei, L., Xie, J., Wu, L., Yao, J., Zhu, L., & Liu, A. (2023). Profiles of self-compassion and psychological outcomes in cancer patients. *Psychooncology*, 32(1):25-33.

<https://doi.org/10.1002/pon.5931>

Young, H., & Kotera, Y. (2022). Menopause and body image: The protective effect of self-compassion and mediating role of mental distress. *British Journal of Guidance and Counselling*, 50(2):321-338.

<https://doi.org/10.1080/03069885.2021.2009770>

Yusuf, L. (2016). Depression, anxiety and stress among female patients of infertility; A case control study. *Pakistan Journal of Medical Sciences*, 32(6):1340-1343.

<https://doi.org/10.12669/pjms.326.10828>

Zaami, S., Melcarne, R., Patrone, R., Gullo, G., Negro, F., Napoletano, G., *et al.* (2022a). Oncofertility and reproductive counseling in patients with breast cancer: A retrospective study. *Journal of Clinical Medicine*, 11(5):1311.

<https://doi.org/10.3390/jcm11051311>

Zaami, S., Stark, M., Signore, F., Gullo, G., & Marinelli, E. (2022b). Fertility preservation in female cancer sufferers: (Only) a moral obligation? *The European Journal of Contraception and Reproductive Health Care*, 27(4):335-340.

<https://doi.org/10.1080/13625187.2022.2045936>

Zhu, L., Yao, J., Wang, J., Wu, L., Gao, Y., Xie, J., *et al.* (2019). The predictive role of self-compassion in cancer patients' symptoms of depression, anxiety, and fatigue: A longitudinal study. *Psychooncology*, 28(9):1918-1925.

<https://doi.org/10.1002/pon.5174>