

Nutritional strategies for the mitigation of chemotherapy side effects in women with breast cancer

Estrategias nutricionales para la mitigación de efectos secundarios de la quimioterapia en mujeres con cáncer de mama

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Manuscript information:

Recibido/Received:12/06/25

Revisado/Reviewed: 16/06/25

Aceptado/Accepted: 05/10/25

ABSTRACT

Keywords:

breast cancer; chemotherapy;
nutritional intervention; side
effects

The objective of this study was to evaluate the impact of nutritional interventions on reducing chemotherapy-induced side effects in women with breast cancer (BC). To this end, a literature review was conducted in scientific databases, compiling 13 articles published between 2020 and 2025 that addressed the use of diets and supplements in patients with BC undergoing chemotherapy. Official sources and websites specializing in oncology nutrition were also consulted to supplement the information. Mediterranean, ketogenic, plant-based, and intermittent fasting-mimicking diets showed mild to moderate benefits. These improvements were primarily observed in quality of life and in the reduction of common symptoms, such as fatigue, nausea, and gastrointestinal disorders. Furthermore, supplements such as probiotics, synbiotics, and melatonin showed positive effects on some specific symptoms, promoting the overall well-being of patients. Although the results obtained are promising, the studies agree that more scientific evidence is still needed to establish solid clinical recommendations. In this context, nutritional intervention could be considered a useful complementary strategy to mitigate the adverse effects of chemotherapy in women with breast cancer.

RESUMEN

Palabras clave:

cáncer de mama; quimioterapia;
intervención nutricional; efectos
secundarios

El objetivo de este trabajo fue evaluar el impacto de intervenciones nutricionales en la reducción de efectos secundarios provocados por la quimioterapia en mujeres con cáncer de mama (CM). Para ello, se realizó una revisión bibliográfica en bases de datos científicas, recopilando 13 artículos publicados entre 2020 y 2025 que abordaron el uso de dietas y suplementos en pacientes con CM bajo tratamiento quimioterápico. También se consultaron fuentes oficiales y sitios especializados en nutrición oncológica para complementar la información. Las dietas

mediterránea, cetogénica, basada en plantas y aquellas que simulan el ayuno intermitente mostraron beneficios leves a moderados. Estas mejoras se observaron principalmente en la calidad de vida y en la reducción de síntomas comunes, como la fatiga, las náuseas y los trastornos gastrointestinales. Por otro lado, suplementos como los probióticos, los simbióticos y la melatonina evidenciaron efectos positivos sobre algunos síntomas específicos, favoreciendo el bienestar general de las pacientes. Aunque los resultados obtenidos son prometedores, los estudios coinciden en que aún es necesaria una mayor cantidad de evidencia científica para establecer recomendaciones clínicas sólidas. En este contexto, la intervención nutricional podría considerarse una estrategia complementaria útil para mitigar los efectos adversos de la quimioterapia en mujeres con cáncer de mama.

Introduction

Cancer is one of the most significant public health problems and one of the leading causes of mortality on a global scale. Within this panorama, breast cancer (BC) is the malignant neoplasm with the highest incidence in the female population (1). Not only does it have the highest prevalence among women, but it is also the second most frequent cause of cancer death in this demographic group, second only to lung cancer in terms of lethality (2-5) (2-5). The figures reported by the World Health Organization (WHO) are alarming and underscore the magnitude of the problem: approximately 2.3 million new cases were diagnosed worldwide in 2020 and, by 2022, 670,000 deaths resulting from this disease were recorded. It is noteworthy that its incidence shows a continuous upward trend, a phenomenon particularly accentuated in developing countries, which is attributed to a complex interaction of factors such as the progressive aging of the population, the increasing exposure to certain environmental factors and the widespread adoption of lifestyles considered unhealthy (6).

From a histopathologic perspective, MC commonly originates in the epithelial cells lining the mammary ducts or lobules. In its early stages, the disease may be asymptomatic, making early detection difficult. However, as it progresses to more advanced stages, it usually manifests a number of obvious clinical signs, such as the appearance of palpable masses in the breast or axilla, visible skin alterations such as dimpling or redness, or the presence of abnormal secretions through the nipple (6,7). The diagnostic process is a fundamental pillar for the correct approach to the pathology and is based on a multimodal approach that includes a thorough physical examination by a professional, the use of high-resolution imaging techniques such as mammography, ultrasound or magnetic resonance imaging, and is confirmed definitively by histological analysis of a tissue sample (biopsy) (7-9).

Regarding its etiology, MC is widely recognized as a disease of multifactorial nature (10). Its development is the result of an intricate interaction between a genetic predisposition, in which mutations in high penetrance genes such as BRCA1 and BRCA2 stand out (11) and a series of hormonal, environmental factors and those directly related to the individual's lifestyle (12) For a better understanding and clinical management, these risk factors are usually classified into two large groups: on the one hand, the modifiable ones, which include habits that can be intervened upon such as diet, tobacco and alcohol consumption, or the management of body weight to avoid obesity (3,5,12) on the other hand, the non-modifiable ones, which are inherent to the individual, such as advanced age, female sex, and family history of the disease (2,13).

The therapeutic approach to MCC is intrinsically multidisciplinary and highly personalized, since the strategy to be followed is defined according to the molecular subtype of the tumor, its degree of progression at the time of diagnosis and other individual biological features (14-16). The therapeutic arsenal available is broad and includes procedures such as surgery, radiotherapy, chemotherapy, hormonal therapies and targeted therapies, which specifically target certain vulnerabilities of cancer cells (11,17,18) (11,17,18) Within this spectrum, surgery is established as the fundamental first line of treatment for newly diagnosed patients, who may opt for a total mastectomy or for breast-conserving surgery that preserves part of the breast (18). In addition, and often as an adjuvant therapy to surgery, chemotherapy, a systemic treatment consisting of the administration of powerful drugs, either orally or intravenously, can be used to destroy cancer cells, preventing their ability to grow and divide (3). Despite its proven efficacy in improving survival rates, chemotherapy is not without a considerable burden

of toxicity, being associated with a wide range of adverse effects that significantly impair patients' quality of life (QoL), including debilitating fatigue, nausea, vomiting, oral mucositis, neutropenia (decrease in white blood cells), profound metabolic changes, and various psychological disorders such as anxiety or depression (19-25).

Faced with this complex scenario, nutritional intervention emerges as a complementary strategy of great interest and potential. In recent years, different dietary strategies have been rigorously studied for their ability to mitigate chemotherapy-derived side effects in women diagnosed with MC (26-28). Among the most prominent is the Mediterranean diet (MD), a dietary pattern characterized by a high consumption of fruits, vegetables, legumes, whole grains, extra virgin olive oil and fish (29,30). Potent anti-inflammatory and antioxidant properties are attributed to this dietary model, which could contribute to reducing the severity of fatigue and improving the overall perception of QoL during treatment (31-33). In fact, recent studies in this field suggest that its follow-up may provide mild to moderate benefits, including a marked reduction in serum lipids and an improvement in several metabolic parameters (34) (34).

In parallel, another promising line of research focuses on diets that simulate the metabolic effects of fasting, especially the *Fasting Mimicking Diet* (FMD). This dietary protocol induces physiological responses similar to those of prolonged fasting without generating drastic weight loss or significant malnutrition (20,35,36). Accumulated scientific evidence suggests that its application may be effective in reducing gastrointestinal and hematologic toxicity associated with chemotherapy, as well as in improving certain immunological markers and, consequently, increasing overall tolerance to cancer treatment (37). Other variants within this approach, such as *Short Term Fasting* (STF) and *Time Restricted Eating* (TRE), have also demonstrated beneficial results in similar contexts (23,38,39) (23,38,39).

The ketogenic diet, defined by its high content of healthy fats and severe carbohydrate restriction, represents another strategy of interest. Its main mechanism of action is the induction of a metabolic state known as ketosis, which limits the availability of glucose as a major energy source for tumor cells, which often depend on it for proliferation (37). It has been observed in several studies that the implementation of this diet can improve QoL, decrease the sensation of fatigue and optimize the inflammatory and metabolic profile in some oncology patients (40) (40). In parallel, a predominantly *plant-based* nutritional approach, which is characterized by being high in plant-based proteins and rich in phytochemicals and bioactive compounds, has demonstrated in clinical studies its ability to significantly reduce fatigue and improve body composition, aspects of great relevance during the strenuous process of oncological treatment (41).

Finally, the field of nutritional supplementation has also been studied as a support in this context. It has been observed that the administration of synbiotics, which combine prebiotics and probiotics, can have a beneficial effect on the health of the gut microbiota, helping to reduce common digestive symptoms such as nausea and loss of appetite (42). Melatonin, a hormone known for its role in the regulation of the sleep-wake cycle, could modulate the perception of neuropathic pain altered by chemotherapy, although it has not shown significant effects on insomnia in these patients (43) (43). Likewise, administration of other specific probiotics, such as *Bacteroides fragilis* 839, has also shown positive results in protecting against myelosuppression and other treatment-induced digestive toxicities (44).

By way of conclusion, while it is true that the scientific evidence in this area is still in a phase of development and consolidation, the above findings as a whole strongly suggest that nutritional treatment has considerable potential to mitigate the side effects of chemotherapy and thus substantially improve the QoL of patients with MC. This reality underscores the imperative need to continue to drive research and the development of clinical nutritional guidelines that are personalized and based on the strongest available evidence.

Method

The purpose of this literature review is to carry out a detailed and critical analysis of a variety of academic papers, scientific research and specialized articles. The main purpose of this analysis is, based on currently available scientific evidence, to understand and demonstrate the relevance of having an adequate and personalized nutritional plan for patients diagnosed with MC undergoing chemotherapy treatment. This review also seeks to identify and establish the most effective and appropriate nutritional strategies that can contribute significantly to improving QoL in these patients. It also aims to evaluate how these interventions can help reduce or mitigate the side effects caused by chemotherapy, which often have a considerable impact on the general health and physical and emotional well-being of cancer patients.

The process of searching and compiling the scientific articles included in this review began on February 3, 2025 and concluded on April 13, 2025. During this period, an exhaustive, meticulous and systematic exploration of a large number of scientific publications from various recognized academic databases was carried out. To ensure the quality and relevance of the selected information, a series of filters were applied:

- Publication date between 2020 and 2025. However, some studies published prior to that date have been used due to their great relevance.
- Research articles and essays whose sample is human.
- Studies taken from indexed journals with an impact factor ≥ 1.5 .

The search methods used in the databases were as follows:

1. Pubmed: The following filters were established: 5 years old and “free full text”. These were the keywords used:

- **“Breast cancer treatment”:** a total of 5,979 articles were obtained from this search of which 10 were used for this review.
- **“Breast cancer chemotherapy side effects”:** a total of 1,806 articles were obtained from this search of which 4 were used for this review.
- **“Diet chemotherapy cancer side effects”:** a total of 143 articles were obtained from this search of which 2 were used for this review.
- **“Mediterranean diet breast cancer”:** a total of 57 articles were obtained from this search, of which 5 were used for this review.
- **“Fasting chemotherapy breast cancer”:** a total of 28 articles were

obtained from this search, of which 8 were used for this review.

- **"Keto chemotherapy breast cancer"**: a total of 5 articles were obtained from this search of which 2 were used for this review.
- **"Supplementation breast cancer chemotherapy"**: a total of 47 articles were obtained from this search of which 3 were used for this review.

2. Frontiers: These were the keywords used in this database to find the articles:

- **"Diet chemotherapy cancer side effects"**: a total of 36,450 articles were obtained from this search, of which 1 was used for this review.
- **"Fasting chemotherapy breast cancer"**: a total of 16,104 articles were obtained from this search of which 1 was used for this review.

3. Google Scholar: Thanks to this search engine, it was possible to access the full text of numerous articles, which was very useful for the development of the work.

4. Internet: In Google, official websites such as WHO, Heart, etc. were accessed in order to explain in detail updated concepts and statistics.

Finally, 44 articles were found for the present work. Of these, 13 studies were selected and analyzed in depth to establish more detailed conclusions on the effect of different nutritional strategies on the adverse effects of chemotherapy for MC.

Results

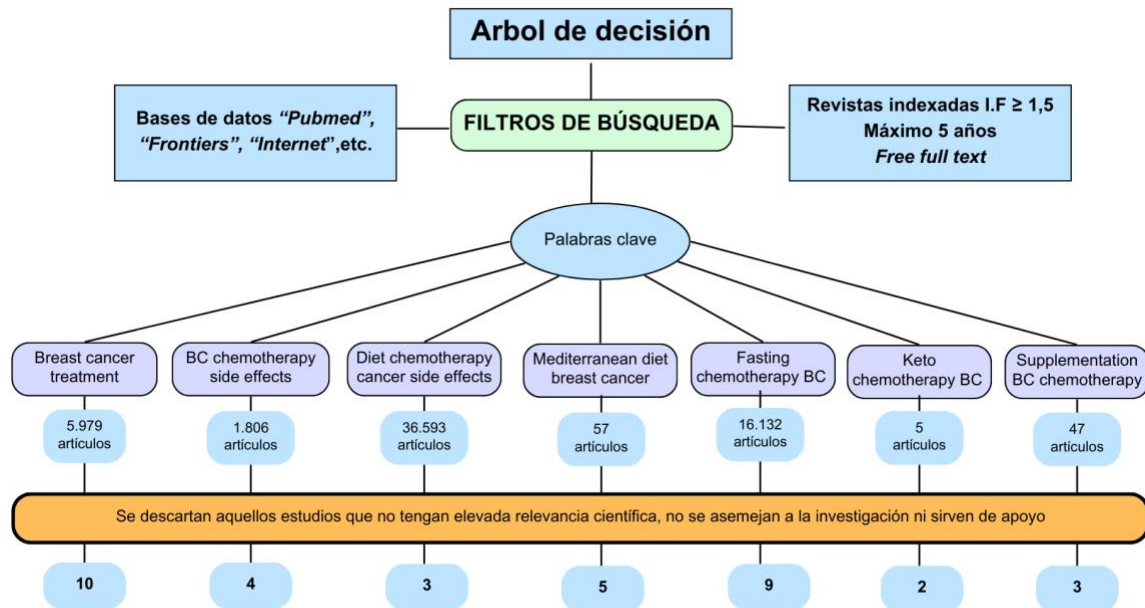


Figure 1. Outline of the bibliographic search. Studies selected and analyzed for this work .

Discussion and Conclusions

Nutritional intervention during chemotherapy treatment is proposed as an effective complementary strategy to improve QoL in women with MC, as well as to reduce the intensity and frequency of side effects derived from pharmacological treatment. Emerging scientific evidence suggests that proper nutrition can have a positive impact on the clinical course and overall well-being of oncology patients.

First, it is relevant to analyze certain dietary patterns that could offer specific benefits against chemotherapy-induced adverse effects. Among them, the Mediterranean Diet (MD), recognized for its healthy properties and balanced nutritional profile, stands out. This diet is based on a high consumption of vegetables, fruits, legumes, olive oil and fish, and has been associated with multiple protective effects against chronic diseases.

Several studies analyzed, summarized in Table 1, suggest that adherence to a DM can generate mild to moderate positive effects in patients with MS receiving chemotherapy (32,33) (32,33). The findings coincide in highlighting the antioxidant and anti-inflammatory character of this diet, attributable to its richness in bioactive compounds present in plant foods and healthy fats. These components seem to contribute to mitigate symptoms such as fatigue, one of the most common side effects of the treatment.

According to Kleckner et al. (32) this dietary pattern favors an adequate intake of macro and micronutrients, which improves energy production and helps to counteract processes related to metabolic dysfunction, oxidative stress and chemotherapy-induced inflammation.

In short, although further scientific support is still needed, the reviewed studies indicate that a well-planned DM, rich in antioxidant and anti-inflammatory foods, can be a useful tool as part of the adjuvant nutritional approach in patients with MC under chemotherapeutic treatment.

Table 1 Studies on the Mediterranean diet in women with CM.

Author	Year	Type of study	Population and sample	Duration	Results
Kleckner et al. (32)	2022	Randomized clinical trial	33 women aged 35-65 years with stage I-III CM scheduled for chemotherapy or with at least 6 weeks of treatment remaining	8 weeks	Patients demonstrated high adherence to DM benefiting from a mild-moderate effect on fatigue reduction between the 4th and 8th week.
Zuniga et al. (33)	2019	Randomized clinical trial	153 overweight or obese women with early stage I-III CM undergoing treatment	6 months	Patients with greater adherence to the anti-inflammatory dietary pattern experienced improvements in endothelial function and reductions in serum cholesterol and triglycerides as well as less mental and physical fatigue.

Second, several studies have been reviewed focusing on the effect of fasting-like diets on the side effects caused by chemotherapy in breast cancer (BC) patients. The most relevant results of this review are summarized in Table 2. This type of dietary intervention has attracted the interest of the scientific community for its potential to improve tolerance to treatment and reduce the toxicity associated with antineoplastic drugs.

As mentioned above, fasting or caloric restriction seems to activate certain physiological mechanisms that not only increase the sensitivity of tumor cells to treatments, but also protect healthy cells, reducing the adverse effects generated by chemotherapy. This protective effect has been explored in different clinical studies, especially through the *Fasting-Mimicking Diet* (FMD) model, a diet that mimics the effects of fasting by severe calorie and protein restriction during a controlled period.

Of the six studies analyzed, four of them (35,36,36,36,38) were (35,36,36,38) highlight the efficacy of FMD as an adjuvant nutritional intervention. This diet, applied during the three days prior to and the day of chemotherapy administration, showed important clinical benefits such as a decrease in gastrointestinal and hematological toxicities, as well as an improvement in metabolic parameters.

In terms of specific results, the studies by Lugtenberg et al. (20) and de Groot et al. (36) reported significant reductions in side effects such as fatigue, nausea, vomiting and insomnia. In parallel, research by Vernieri et al. (35) and Bahrami et al. (38) also observed hematological improvements, with higher levels of erythrocytes and neutrophils in the group following FMD versus the control group.

On the other hand, Bauersfeld et al. proposed an approach closer to traditional fasting, called *Short-Term Fasting* (STF), which involves a food deprivation of approximately 60 hours distributed before and after treatment. This strategy showed improvements in quality of life, a reduction in mental fatigue and a lower intensity of symptoms such as nausea or abdominal pain.

Finally, the study by Christensen et al. (23) explored a different modality: *Time-Restricted Eating* (TRE), with an intake window of 8 to 10 hours per day. The results showed not only improvements in quality of life, but also a significant reduction in visceral fat and an overall improvement in metabolic profile.

It should be noted that all the studies reviewed, regardless of the specific restriction approach, reported positive effects. Patients showed good adherence to these patterns, which reinforces their clinical feasibility. Taken together, the findings suggest that fasting-like diets may represent a promising nutritional intervention for breast cancer patients undergoing chemotherapy, improving both their tolerance to treatment and their quality of life (20,23,35,36,38,39).

Table 2 Studies on fasting-like diets in women with CM.

Author	Year	Type of study	Population and sample	Duration	RESULTS
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Lugtenberg et al. (20)	2020	Randomized clinical trial	129 women with HER-2 negative CM stages II-III	4 years	Reduction of side effects (fatigue, nausea/vomiting and insomnia). Patients also perceived improvements in QoL and presented moderate weight loss.
Vernieri et al. (35)	2022	Clinical trial	101 women with MC receiving chemotherapy anti-tumor treatment	1 month	Patients experienced a greater response to treatment and a reduction in tumor size on the Miller and Payne scale, in addition to a significant improvement in QoL. The control group presents greater damage to T lymphocytes due to the toxicity of chemotherapy causing more aggressive effects.
De Groot et al. (36)	2020	Randomized clinical trial	131 women with stage II-III MC	2 years	Mild effect in reducing symptoms secondary to chemotherapy such as fatigue and nausea but do not demonstrate such different results between the two groups in perceived toxicity.

Bahrami et al. (38)	2024	Randomized controlled trial	44 women with HER-2 receptor-negative CM	2 years	Patients suffered less frequent vomiting. In addition, they also had higher erythrocyte and neutrophil counts, while their IGF-1 and hs-CRP levels were decreased. In contrast, the control group suffered a regular number of vomiting episodes and presented neutropenia.
Bauersfeld et al. (39)	2018	Randomized crossover trial	34 women officially diagnosed with MC or ovarian cancer scheduled for chemotherapy treatment	18 months	Short-term fasting is safe and appears to significantly improve the QoL of patients as well as improve symptoms such as fatigue.
Christensen et al. (23)	2020	Randomized clinical trial	130 women scheduled to receive chemotherapy who have been diagnosed with early stage I-III of MBC	2 years	Patients show a reduction in visceral fat accumulation and improvements in metabolic markers as well as a slight attenuation of common chemotherapy-derived symptoms.

Third, the results of recent studies examining the impact of two specific dietary approaches on the side effects of chemotherapy in patients with MC have been reviewed: the ketogenic diet and a high-protein plant-based diet. The key findings of these investigations are summarized in Table 3.

First, the ketogenic diet, characterized by high fat and low carbohydrate intake, has been

studied for its ability to induce a change in energy metabolism. This alteration may be beneficial in the oncological context, by hindering the growth of tumor cells that depend mainly on glucose as an energy source. In this regard, the study by Khodabakhshi et al. (40) suggests that this diet, used as an adjuvant during chemotherapeutic treatment, can contribute to an overall improvement in the clinical condition of patients. In their research, a significant decrease in both body mass index (BMI) and total body weight was observed in the group following the ketogenic diet. In addition, patients reported better QoL and a lower incidence of mild side effects, such as nausea and vomiting, compared to the control group. However, the authors clarify that the intervention showed no impact on more severe or persistent treatment-associated symptoms.

On the other hand, the study by Sathiaraj et al. (41) focused on a plant-based diet, rich in fruits and vegetables, combined with a high protein content. This diet stands out for its antioxidant and anti-inflammatory profile, which makes it potentially useful for mitigating chemotherapy-induced stress. In this case, the results showed a marked reduction in fatigue, which the authors attribute to the protective action of the antioxidant compounds. A significant decrease in BMI and body fat was also evidenced in the patients.

Overall, although the observed effects on QoL were modest, both nutritional approaches showed positive results and can be considered safe and potentially effective strategies as an adjunct to chemotherapeutic treatment in patients with MC.

Table 3 Studies on ketogenic diet and high-protein plant-based diet in women with CM.

Author	Year	Type of study	Population and sample	Duration	RESULTS
Khodabakhshi et al. (40)	2019	Randomized clinical trial	60 women with advanced localized metastatic CM scheduled for chemotherapy	3 months	In the intervention group, there was a reduction in blood glucose levels, as well as a reduction in weight and consequent BMI. In addition, they also reported better QoL and less frequent nausea and vomiting.
Sathiaraj et al. (41)	2023	Randomized controlled trial	103 women newly diagnosed with MC and scheduled for adjuvant chemotherapy	2 months	Patients who followed the prescribed diet demonstrated a significant

					reduction in mental and physical fatigue, as well as a decrease in BMI and body fat.
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Finally, several studies evaluating the effect of nutritional supplementation in mitigating the side effects caused by chemotherapy in patients with MC have been compiled. The most important results of this line of research are summarized in Table 4. Once the different dietary patterns have been analyzed, it is relevant to address the potential role that certain supplements can play as part of complementary nutritional support during cancer treatment.

First, the study by Khazaei et al. (42) focuses on the administration of synbiotics, a combination of prebiotics and probiotics, for a period of eight weeks. The results obtained show a significant improvement in intestinal symptomatology, specifically in the regulation of intestinal transit and the reduction of diarrhea episodes associated with intestinal dysbiosis caused by chemotherapy drugs. Likewise, patients who received this supplement also reported a lower incidence of nausea and vomiting, as well as a notable decrease in the perception of fatigue, one of the most common and limiting symptoms during treatment.

Continuing with the intestinal axis, the study by Zeng et al. (44) specifically investigated the effects of the probiotic *Bacteroides fragilis* 839. This microorganism showed a positive effect in reducing myelosuppression, one of the most frequent hematological complications in patients under chemotherapy. Although the results on the improvement of gastrointestinal toxicities were less conclusive, benefits similar to those described with the use of symbiotics were observed. (42).

On the other hand, the study by Palmer et al. (43) addressed the effects of oral melatonin as an adjunct to cancer treatment. The administration of 20 mg daily during the chemotherapy cycle showed promising results in the regulation of the Descending Pain Inhibitory System (DPMS), helping to restore the function of this system affected by the drugs. In addition, improvements in dermal pain tolerance (DTT) and thermal pain threshold (TPU) were observed. However, despite the known relationship of melatonin with sleep quality, no significant improvements in insomnia were observed in this study.

Taken together, these findings support the use of certain supplements as support in the management of specific chemotherapy-derived symptoms, highlighting their potential usefulness as part of a comprehensive nutritional intervention in patients with CM.

Table 4 Studies on supplementation in women with CM

Author	Year	Type of study	Population and sample	Duration	Results
Khazaei et al. (42)	2023	Randomized double-blind clinical trial	67 women diagnosed with MC admitted as inpatients for chemotherapy	8 weeks	Patients experienced a significant reduction in fatigue and less frequent intestinal problems (diarrhea and constipation). Slight improvements were also recorded in the reduction of nausea and vomiting, in addition to minimizing the risk of developing anorexia.
Zeng et al. (44)	2024	Randomized trial	40 women in early stage of MC	2 months	A reduction in myelosuppression has been recorded, in addition to a lower decrease in white blood cells and neutrophils. Patients also experienced fewer events of nausea and diarrhea.
Palmer et al. (43)	2019	Randomized double-blind clinical trial	36 women aged 18-75 years scheduled for their first cycle of adjuvant CM chemotherapy	2 weeks	The study indicated improvements in DPMS functionality as well as pain thresholds. No conclusive results on sleep improvement were obtained.

After detailed analysis of the available scientific literature, it can be affirmed that an appropriate nutritional intervention has the potential to significantly improve tolerance to chemotherapy in patients with MC. Although the compiled findings are promising, further research is still needed to establish concrete clinical recommendations, as well as to determine precisely what would be the most effective and safe dietary approach in this context.

Even so, the studies reviewed allow us to draw preliminary conclusions that could serve as a basis for the development of future general guidelines. First, it has been shown

that following a healthy dietary pattern, such as the Mediterranean diet, may offer slight but clinically relevant benefits. This type of diet, characterized by its flexibility, richness in antioxidant compounds and easy adherence, has been shown to be effective in reducing symptoms such as fatigue, as well as representing a sustainable option for patients in the long term.

On the other hand, both the ketogenic diet and a high-protein plant-based diet have also shown positive effects, especially in improving QoL, reducing fatigue and decreasing body mass index and body fat. However, the evidence on these diets is still limited, and their effects need to be corroborated by research of greater scope and methodological rigor.

The dietary pattern that seems to have the strongest scientific basis is undoubtedly that of fasting-like diets. Among these, FMD stands out as one of the most promising options, combining safety, good tolerance and effectiveness in reducing the most common adverse effects of chemotherapy. The results obtained in the studies analyzed position FMD as a potentially effective tool for clinical implementation.

Finally, it is worth mentioning the complementary role of certain supplements such as symbiotics, the probiotic *Bacteroides fragilis* 839 and melatonin. Although the evidence on its use is still scarce, the reported beneficial effects point to its possible usefulness as an additional support to a broader nutritional intervention, especially in the management of specific symptoms such as gastrointestinal disturbances, fatigue or pain threshold dysfunction.

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