



Dietary strategies for reducing symptoms associated with endometriosis: a literature review

Estratégias dietéticas para reduzir los síntomas asociados a la endometriosis: una revisión de la literatura

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Abstract: Endometriosis is an inflammatory pathology characterized by changes in ovarian tissue in women, of reproductive age. People with this disease present symptoms ranging from dysmenorrhea, dyspareunia, chronic pelvic pain, chronic fatigue and difficulty getting pregnant. Therefore, this study is a bibliographical review of the literature with the objective of evaluating the role of nutrition in the treatment of women diagnosed with endometriosis. Thus, the health descriptors (DeCs) used in English and Portuguese were endometriosis, woman and diet using the databases (PubMed, VHL and SciELO), using as subsidies the articles available in full, in English and Portuguese and published in the last 10 years (2013 to 2023). Finally, based on the findings, it is possible to point out the importance of adhering to a healthy diet and the relevant role of micronutrient supplementation, such as vitamins C, D, E and B12 and the minerals Zinc and Potassium, for women with endometriosis.

Keywords: *Food; Endometriosis; Women.*

Resumen: la endometriosis es una patología inflamatoria caracterizada por alteraciones del tejido ovárico en mujeres, generalmente en edad reproductiva. Las personas con esta enfermedad presentan síntomas que van desde dismenorrea, dispareunia, dolor pélvico crónico, fatiga crónica y dificultad para quedarse embarazada. Por lo tanto, este estudio es una revisión bibliográfica de la literatura con el objetivo de evaluar el papel de la nutrición en el tratamiento de las mujeres diagnosticadas de endometriosis. Así, los descriptores de salud (DeCs) utilizados en inglés y portugués fueron: Endometriosis, mujer y dieta utilizando las bases de datos (PubMed, BVS y Scielo), utilizando como subsidios los artículos disponibles en su totalidad, en inglés y portugués y publicados en los últimos 10 años (2013 a 2023). Finalmente, con base en los hallazgos, es posible señalar la importancia de adherirse a una dieta saludable y el papel relevante de la suplementación con micronutrientes, como las vitaminas C, D, E y B12 y los minerales Zinc y Potasio, para las mujeres con endometriosis.

Palabras clave: *Alimentación; Endometriosis; Mujeres.*

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INTRODUCTION

The first report on the symptoms of endometriosis was in 1769 by the Scottish doctor Arthur Duff, and in 1860, the German doctor Daniel Shroen described it in his work "*Disputatio Inauguralis Medica de Ulceribus Ulceri*" (Smolarz; Szyłło; Romanowicz, 2021). Over the years, new studies and theories have emerged to clarify the pathogenesis of endometriosis (Smolarz; Szyłło; Romanowicz, 2021).

Endometriosis is an inflammatory pathology characterized by alterations in the tissues of the ovary in women, usually of reproductive age. Patients with this disease have symptoms ranging from dysmenorrhea, dyspareunia, chronic pelvic pain, chronic fatigue and difficulty getting pregnant (Nácul and Spritzer, 2010). The clinical diagnosis must be made by a gynecologist through a biopsy.

Despite being a chronic disease, environmental factors such as dietary pattern and lifestyle are directly associated with the progression of the disease, in addition, drug treatment contains side effects, which often makes dietary treatment a safe and affordable alternative (Porfírio *et al.*, 2017).

Thus, adopting an adequate dietary pattern, including legumes, fruits, vegetables, sources of complex carbohydrates, protein and good fats, is necessary to result in the progressive improvement of the most recurrent symptoms, because a good diet has anti-inflammatory potential, among other important functions that interact in the inflammatory response caused by patients with endometriosis (Barbosa; Blanch, 2021).

Therefore, the main objective of this review, conducted by analyzing the literature, was to evaluate the role of diet in the treatment of women diagnosed with endometriosis. To verify diets and supplementation processes in the treatment of the disease, evaluating the benefits and harms because of the dietary pattern adopted.

THEORETICAL BACKGROUND

Endometriosis is an inflammatory condition that affects the cells of the endometrium, the tissue responsible for lining the uterus, especially in women of reproductive age. In this disorder, there is an abnormality in the expulsion and location of the endometrial cells, i.e., they move in the opposite direction, instead of being expelled by menstruation, they are directed out of the uterine cavity or another reproductive region (Nácul; Spritzer, 2010).

According to research, in 2021, in Brazil, one in ten women sought medical attention reporting symptoms characteristic of endometriosis, and in the same year, basic health care units conducted 11,400 outpatient procedures and 3,700 hospital procedures. The data shows that this disease has a significant impact on the female population, causing infertility in around 60% and persistent pelvic pain in 70%. The

most common age group for its development is women over 40 years of age, however, young people of reproductive age are also prone to the pathology, but with lower probabilities (Cardoso *et al.*, 2020).

The disease can be classified into two groups of women: asymptomatic and symptomatic. In this sense, women who have no symptoms, although they are free from frequent pain, are held hostage by infertility and the dream of motherhood (Nácul and Spritzer, 2010). Infertility becomes a side effect of the blockage of a woman's menstrual cycle due to endometriosis, since it is a preparation for future pregnancies (Oliveira, 2022).

Symptoms usually begin in adolescence, initially with cramp-like pains, and worsen over the years. However, symptoms can range from menstrual cramps, pain during sex, bleeding during urination and bowel movements, fatigue and diarrhea to symptoms of endometriosis. According to studies, symptoms can be one of the factors that cause stress and have a direct impact on these women's quality of life (Oliveira, 2022).

Another important point is the classification of endometriosis, which is a source of conflict between authors. However, the inflammatory disorder in the ovary can be classified according to its extent and the size of the ovarian endometriomas. According to Martins, in 2019, it can be categorized as mild (stage II), moderate (stage III) and severe (stage IV) (Sofia; Pinheiro, 2022).

Due to the time, it takes for symptoms to appear, or the lack of symptoms and their variation, it is difficult to diagnose and treat this disorder, which further impacts on the lives of the women affected (Adoamnei, 2021). Diagnosis usually occurs after a period and, in many cases, years after the first symptoms are reported, due to its complexity and variety. As a result, one of the main aims of treating the condition is to reduce or relieve symptoms, such as improving pain and fertility and hindering its progression (Sofia; Pinheiro, 2022).

There are many reasons that impact on the quality of life of women affected by endometriosis, these conditions negatively affecting not only reproductive life, but also other areas such as social relationships, sexual life and even mental health (Adoamnei *et al.*, 2021). Thus, the implication of symptoms on quality of life is diverse, especially when it comes to emotional, self-esteem, and behavioral status (Sofia; Pinheiro, 2022).

Thus, in these cases, family support, counseling and a focus on self-care are extremely important factors that contribute to the patient's meaningful treatment. Family support and encouraging counseling intensify coping with the disease, as well as active participation in programs that help with treatment, emotional control, acceptance of therapies and other benefits. In addition, dietary changes, the use of supplements and physical activity act positively as complementary therapies in the care of people with

endometriosis. An appropriate dietary pattern can alleviate symptoms and even improve mood, because the diet acts on metabolic, hormonal and inflammatory processes (Sofia; Pinheiro, 2022).

However, this whole process requires good adherence due to the need to change habits and the requirement to maintain new eating and lifestyle patterns (Sofia; Pinheiro, 2022). In short, although it is not simple, the resulting benefits provide feelings of achievement and capacity for accomplishment, as well as improved quality of life, which is essential for conducting daily activities.

A balanced and moderate diet is fundamental in the treatment of endometriosis, and adequate body weight is another factor that provides a better quality of life and a reduction in symptoms in women with this pathology. Thus, monitoring with a professional is essential in the treatment of the disease, to adjust nutrient needs and supplementation, when necessary (Rodrigues *et al.*, 2022).

In this context, nutritionists recommend anti-inflammatory diets, with increased consumption of fruit and vegetables, adequate calcium intake and antioxidants being fundamental strategies for treating the condition. On the other hand, ultra-processed foods, red meat and foods rich in sugar and fats should be avoided, as they can worsen the worsening of endometriosis (Rodrigues *et al.*, 2022).

Chronic illnesses are associated with changes in the performance of routine activities. In this way, endometriosis is responsible for negatively affecting various areas of women's lives in relation to work and emotional life (Fisioter; Mov, 2022). Thus, adhering to a new lifestyle, including physical activity and an adequate dietary pattern, although initially challenging, can reduce the negative impacts of the disease (Neumann *et al.*, 2023).

Physical activity has been identified as an important factor, as it has anti-inflammatory effects and is a less invasive therapeutic approach, making it an interesting tool for treating endometriosis, with the aim of improving symptoms (Tennfjord; Gabrielsen; Tellum, 2021). Therefore, both factors, diet and active activity, are positive and assertive means and should be included as treatment tools for women with endometriosis.

Regarding dietary patterns that generate benefits in these cases, the Mediterranean and anti-inflammatory diets can be mentioned. That said, the Mediterranean diet is based on the consumption of fruit, vegetables and good fats, as well as the inclusion of foods such as fish, eggs and poultry. It also includes a moderate intake of red meat, dairy products and added sugar (Cirillo *et al.*, 2023). As for the anti-inflammatory diet, it is characterized by the removal of inflammatory foods such as gluten, alcoholic beverages, dairy products and in some cases soy should be analyzed.

Dietary intervention with the Mediterranean pattern brings with it the relationship between pain relief in these patients, in addition to the fact that the standardized and individualized diet can be considered

favorable for treatment, remission of symptoms, and in the long term, associated with other interventions helping to improve health and quality of life (Cirillo *et al.*, 2023).

In this context, anti-inflammatory diets can help mitigate the signs of the disease. Thus, this type of dietary pattern consists of removing foods that contain high levels of saturated fat, salt and simple sugars, which are ingredients seen as factors in the appearance of inflammation (Geraldo; Alfenas, 2008). Anti-inflammatory foods such as acerola, açaí, grapes and guava, for example, should therefore be preferred, as they have inhibitors that act directly against mediators involved in inflammatory processes (Silva, 2019).

In addition, the introduction of foods that are sources of probiotics and prebiotics can occur to generate a balance in the intestinal microbiota and contribute to minimizing the inflammation caused by the pathology (Rojas Correa *et al.*, 2023). Antioxidant substances are also properties found in anti-inflammatory diets. Vitamins A, C and E, zinc and copper are nutrients that are encouraged to be consumed in this dietary pattern, due to their beneficial effects in reducing oxidative stress, which contributes to delaying and preventing the development of the disease. When necessary, supplementation of these micronutrients is indicated for an adequate nutritional intake (Porfírio *et al.*, 2017).

In this way, some nutrients are thought to help reduce the development of endometriosis, such as vitamin D, which helps in the process of calcium absorption and increases immunity through its anti-inflammatory properties, which reduce the predisposition to developing endometriosis (Neumann *et al.*, 2023).

Furthermore, foods that are rich in antioxidants, based on studies, reduce the pain of chronic diseases, so vitamin C and vitamin A are nutrients with beneficial potential that should be encouraged to be consumed by women with endometriosis (Chalub; Leão; Maynard, 2020). This set of vitamins has anti-inflammatory properties that can reduce symptoms and increase quality of life. Vitamin deficiency is one of the causes of infertility (Meireles; Martins; Rangel, 2019).

In addition, studies show that eating foods rich in vitamins A, C and E can help reduce free radicals and consequently reduce the progression of the disease, preventing it from reaching a higher level of categorization (Beatriz Da Silva *et al.*, 2020).

METHODOLOGY

This paper is a literature review with the aim of evaluating the role of diet in the treatment of women diagnosed with endometriosis. To this end, a search was conducted in the databases (*PubMed*, *BVS* and *SciELO*), using articles available in full, in English and Portuguese with publications made in the last 10 years (2013 to 2023).

The health descriptors (DeCs) used in English and Portuguese were Endometriosis, woman and diet, using the Boolean expression "AND" to combine two or more keywords. In total, 212 articles were found, of which 13 were selected after reading the titles and, after applying the established criteria, 7 articles were selected to make up the data sample.

All the articles selected were assessed because of their abstracts, followed by a critical reading of all the papers, and finally the data was arranged in a summary table to present the results.

RESULTS AND DISCUSSION

In Box 01, recent data from studies evaluating dietary intake and lifestyle patterns, as well as the supplementation of certain nutrients, on complaints and symptoms associated with endometriosis in women will be presented.

TABLE 01: Summaries of studies on food consumption and the use of supplements to control symptoms associated with endometriosis.

AUTHOR - YEAR	OBJECTIVE	MAIN RESULTS
Harris <i>et al.</i> , 2018	To investigate the intake of alpha-carotene, beta-carotene, betacryptoxanthin, lutein, zeaxanthin and lycopene, present in fruit and vegetables, on the risk of endometriosis.	A non-linear inverse association was observed between higher fruit consumption and the risk of endometriosis confirmed by laparoscopy (Psignificance of the curve= 0.005). This inverse association was particularly evident for citrus fruits. Women consuming ≥ 1 portion of citrus fruits/day had a 22% lower risk of endometriosis compared to those consuming < 1 portion/week. No association was observed between total vegetable intake and the risk of endometriosis. However, women consuming ≥ 1 serving/day of cruciferous vegetables had a 13% higher risk of endometriosis (95% CI = 0.95-1.34; Ptrend= 0.03) compared to those consuming < 1 serving/week. Of the nutrients examined, only beta-cryptoxanthin intake was significantly associated with a lower risk of endometriosis.
Karlsson <i>et al.</i> , 2019	To assess the impact of dietary changes, including increased intake of vegetables, fruit, fish and the use of supplements	Participants experienced an increase in well-being and a decrease in symptoms following changes in diet

	such as minerals, vitamins, omega-3, ginger and turmeric, as well as the exclusion of dairy products, foods containing gluten and carbohydrates, on endometriosis symptoms.	and lifestyle. There was also an increase in energy levels and a deeper understanding of how they could affect their health. However, participants highlighted the lack of support from health professionals. Thus, the research volunteers understood that they could influence their symptoms through lifestyle changes, and they also realized that the support of family and friends was important in implementing and maintaining the changes.
Baek <i>et al.</i> , 2019	To investigate serum concentrations of 25-hydroxyl vitamin D (25(OH)D) and vitamin D binding protein (VDBP) in women with endometriosis according to the severity of the disease, with no direct intervention in relation to vitamin concentrations.	The results showed that women with advanced stages of the disease had low vitamin D levels. The levels were assessed through serological analysis with women affected by the disease and volunteers who did not have the disease.
Nodler <i>et al.</i> , 2020	To determine whether vitamin D or ω -3 supplementation relieves pain, changes the frequency of analgesic use or affects quality of life in young women with endometriosis.	A total of 147 women were examined and 69 were randomly assigned as follows: 27 to vitamin D3; 20 to fish oil; and 22 to placebo. Participants in the vitamin D group experienced significant improvement in pain on the Visual Analog Scale (VAS), however, an improvement of almost identical magnitude was observed in the placebo group. A more modest improvement was observed in the fish oil group. None of the intervention groups were statistically different from placebo.
Amini <i>et al.</i> , 2021	To evaluate the effect of coadministration of vitamin C and vitamin E on oxidative stress (OS) markers, as well as on the severity of pain in women with endometriosis.	A significant reduction in ROS and MDA was observed in the groups that received vitamin C and E supplementation. Group B saw a significant reduction in dyspareunia. In contrast, chronic pelvic pain was increased.
Yarmolinskaya <i>et al.</i> , 2021	To estimate the importance of vitamin D in the pathogenesis of genital endometriosis (GE), to estimate the efficacy of cholecalciferol administration and to draw up schedules for combined therapy together with its application.	It has been established that the prevalent forms of GE are characterized by lower levels of 25(--)D in both peripheral blood (PB) and peritoneal fluid (PF). It was also found that the G/G genotype of the polymorphic variant of the vitamin D receptor gene (VDR) increases the

		<p>risk of GE by 1.9 times. VDR expression was authentically lower in ectopic endometrium compared to eutopic endometrium. Patients with EG do not show cyclical variations in VDR expression in the endometrium, which is contrary to the control. Therapy in combination with cholecalciferol promotes a more express decrease in the pain syndrome associated with endometriosis and psycho-emotional stabilization of GE patients compared to standard hormone modulator therapy.</p>
<p>Roshanzadeh <i>et al.</i>, 2023</p>	<p>To investigate the relationship between dietary micronutrients included in energy intake and the risk of endometriosis.</p>	<p>Analysis of the data showed a significant relationship between the reduction in pelvic pain and adequate consumption of micronutrients such as potassium, calcium and vitamins C, B2 and B12, so those who used fewer micronutrients were at greater risk of endometriosis. Micronutrients were included in the calculation of the estimated energy intake for each group, with 2,443.31 Kcal/day for the group of women with endometriosis and 2,566.42 Kcal/day for the control group.</p>

SOURCE: Authors' data (2023).

According to Harris *et al.* (2018), removing foods considered inflammatory, such as dairy products, gluten and red meat, reduces symptoms of pain, fatigue and stress and improves intestinal flow. In addition, the addition of 3 or more portions of vegetables, fruit and physical activity, according to the study, had a positive impact on the health and quality of life of these women. In this way, the research conducted made it possible to perceive the benefits of altering the diet plan on an individual basis, especially in relation to levels of fruit and vegetables in women affected by endometriosis. Thus, the benefits observed by the participants were an incentive to maintain these new habits. In the same vein, Karlsson et al. in a case-control study in 2019 also showed that opting to consume daily portions of fruit and vegetables reduced the risk of developing the pathology, reinforcing that dietary change is an important tool for health control.

It can therefore be inferred that consuming 3 or more portions of foods such as fruit, legumes and vegetables reduces the chances of developing endometriosis, as well as reducing symptoms. However, the consumption of leafy vegetables increased the predisposition to worsening symptoms of endometriosis,

because some of them contain non-digestible carbohydrates, the FODMAPs, contributing to increased abdominal pain (KARLSSON, J.; PATEL, H.; PREMBERG, A., 2019).

Another study looked at the individual influence of micronutrients on the dietary pattern of patients with endometriosis. Thus, Roshanzadeh *et al.* (2023) found that the consumption of vitamin C and E, due to their antioxidant properties, helps in the process of minimizing the inflammation that usually occurs in chronic diseases such as endometriosis. In addition, adherence to adequate intake of vitamin B12, zinc and potassium through food, when done in a balanced way that respects individualities, is beneficial and can reduce the development or worsening of the pathology. However, this same study conducted in 2023 evaluated the consumption of the micronutrient calcium, which was identified as a risk-reducing factor for the development of the disease, because calcium inhibits muscle contraction in the process of retrograde menstruation, which occurs in women with endometriosis.

As for supplementing with vitamins C and E, a study carried out with women of reproductive age, between 15 and 45 years old, divided into the following groups: a placebo group and another group supplemented with vitamins C, with a dosage of 1000mg/day in 2 tablets of 500mg each, and vitamin E, with a dosage of 800 IU/day in 2 tablets of 400 IU each, both daily for 8 weeks (Amini *et al.*, 2021). Based on this, the positive effect of vitamin supplementation on reducing the damage caused by oxidative stress in endometriosis was observed, due to its ability to eliminate free radicals and stress. Vitamin C's specific functions include acting directly to protect cells against pathologies that are induced by oxidative stress, such as endometriosis. Vitamin E also plays a role in preventing or even delaying this induction. However, it is possible to consider these micronutrients as neutralizing agents and important options for the treatment of endometriosis, with considerable antioxidant action and symptom reduction (Darling *et al.*, 2013).

In a study of young women with endometriosis, vitamin D and fish oil supplementation was used as an alternative treatment to medication. Thus, 69 participants of varying age and BMI were randomly separated into three groups, where one group received vitamin D supplementation at a dose of 2000 IU, another was supplemented with fish oil at a dose of 488 mg, and the control group was used to compare the other groups (Nodler *et al.*, 2020).

The findings of the study showed that supplementing with vitamin D for 6 months reduced pelvic pain. On the other hand, fish oil supplementation did not show a significant change in pain reduction in these adolescent girls when compared to the placebo group, so it can be inferred that treatment with vitamin D is more effective in reducing pelvic pain.

A study conducted by Yarmolinskaya *et al.* (2021) using vitamin D supplementation in 440 women diagnosed with endometriosis of reproductive age, divided into two groups: The first with 240 participants, subdivided into 117 women with standard-dose cholecalciferol supplementation and

modulator therapy regimen, 104 with a 3.75 mg dose of gonadotropin-releasing hormone (aGnRH) agonist and 23 received cholecalciferol plus monotherapy. The second group of 200 participants received standard hormone modulator therapy, with 103 receiving 3.75mg of aGnRH and 97 receiving dienogest 2mg plus monotherapy. The study showed that the patients who received cholecalciferol supplementation had a significant reduction in pain compared to the women who received hormone modulator therapy.

In this context, there is evidence that interventions that improve vitamin D levels can help control symptoms associated with endometriosis. Thus, the study was conducted with women placed in three groups, the first with women who had not been diagnosed with the disease, the second group was made up of women classified with the mild stage and the third, women in the advanced stage of the disease. After collecting serological samples from the participants to assess vitamin D and its relationship with the stage of the disease, it was possible to observe that, although no direct relationship was found between vitamin D levels and endometriosis symptoms in the three groups, it was possible to verify very low amounts of vitamin D in women with advanced endometriosis, although they were not statistically significant in relation to the other groups (Baek *et al.*, 2019).

CONCLUSIONS

There is still little evidence on the relationship between nutritional supplementation and the reduction of endometriosis symptoms, however, based on this study, we can consider the importance of a proper lifestyle and a balanced diet, as well as the benefits associated with an adequate supply of micronutrients such as vitamins C, D, E and B12 and minerals such as zinc and potassium for women with endometriosis.

Based on the findings, it is possible to infer that supplementation with certain micronutrients can be an efficient strategy associated with changes in dietary patterns, enabling a significant improvement in the symptoms caused by endometriosis and, consequently, a reduction in the impact that the disease has on the lives of these women. Furthermore, the need for nutritional monitoring is highlighted to intervene properly and promote efficient strategies in the treatment of endometriosis.

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