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Dietary Interventions and Lifestyle Factors in Endometriosis: A Scoping Review of Their Impact on Inflammation, Pain, Fertility and Quality of Life

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Abstract

Background. Endometriosis is a chronic, estrogen-dependent inflammatory disease affecting approximately 10% of women of reproductive age worldwide. Chronic inflammation, oxidative stress, immune dysregulation and hormonal imbalance contribute to disease progression, pain, infertility and reduced quality of life. Increasing evidence suggests that dietary interventions may play a supportive role in the management of endometriosis by modulating inflammatory pathways and improving clinical outcomes.

Aim. The aim of this scoping review was to examine the role of diet and physical activity in modulating inflammation and symptoms in women with endometriosis, with particular focus on dietary patterns, nutritional supplementation and their impact on pain, fertility and quality of life.

Material and methods. A literature search was conducted using PubMed and Google Scholar databases. Articles published in English between 2017 and 2026 were screened using keywords related to endometriosis, diet, inflammation, pain, fertility, physical activity and nutritional supplementation. Thirty studies meeting the inclusion criteria were included in the final review.

Results. The findings suggest that anti-inflammatory dietary patterns, particularly the Mediterranean diet, may reduce inflammation and improve symptom control in women with endometriosis. Selected nutritional supplements, including omega-3 fatty acids, vitamin D in deficient individuals, and polyphenols, may have potential supportive effects, although the available evidence remains inconsistent.

Conclusions. Dietary and lifestyle interventions may represent valuable complementary approaches in endometriosis management, and further high-quality prospective studies are needed to establish evidence-based nutritional recommendations.

Keywords: endometriosis, diet, physical activity, chronic inflammation, Mediterranean diet, fertility, quality of life

1. Introduction

Endometriosis is a chronic, estrogen-dependent inflammatory disease characterized by the presence of endometrial-like tissue outside the uterine cavity, leading to chronic pelvic pain, fibrosis, adhesions and impaired fertility. The disease typically affects pelvic structures, including the ovaries, pelvic peritoneum and uterosacral ligaments, although lesions may also occur in extraperitoneal sites. As ectopic endometrial-like tissue responds to hormonal fluctuations throughout the menstrual cycle, it triggers recurrent inflammation, progressive tissue remodeling and the development of adhesions. It is estimated that endometriosis affects around 10% of women of reproductive age globally, corresponding to nearly 190 million individuals worldwide. (1)

From a clinical perspective, chronic pelvic pain and infertility represent the most burdensome manifestations of endometriosis. Pain may present as dysmenorrhea, dyspareunia, dyschezia, dysuria or non-cyclical pelvic pain, and is largely driven by chronic inflammation, increased production of pro-inflammatory mediators - including prostaglandin E2 - and neural infiltration of ectopic lesions. Furthermore, endometriosis may impair fertility through anatomical distortion, chronic inflammatory processes and alterations in the peritoneal and endometrial environment, significantly affecting reproductive outcomes and overall quality of life.

Importantly, patient preferences, reproductive goals, symptom severity, and comorbidities should all be considered when planning lifestyle-based interventions. As the clinical presentation of endometriosis is highly heterogeneous, individualized management strategies are likely to provide greater long-term benefits than standardized recommendations applied uniformly to all patients.

The objective of this scoping review was to explore the influence of dietary interventions and lifestyle interventions on inflammation and symptom management in women with endometriosis, with particular emphasis on dietary patterns, nutritional supplementation, physical activity and their effects on pain, fertility, and quality of life.

2. Methods

A scoping review of the available literature was performed using the PubMed and Google Scholar databases. The search strategy included the following keywords: "endometriosis diet inflammation", "endometriosis pain dietary interventions", "endometriosis fertility diet", "gut microbiome endometriosis", "physical activity exercise endometriosis", "omega-3 endometriosis", "vitamin D endometriosis", and "polyphenols endometriosis".

Eligible studies included systematic reviews, randomized controlled trials, narrative reviews, and prospective studies published in English between 2017 and 2026 and conducted in human populations. Conference abstracts, articles without full-text availability, and publications from predatory journals were excluded from the review. Titles and abstracts of potentially relevant publications were screened for eligibility, followed by full-text assessment of studies considered relevant to the research question. Studies were selected according to their relevance to dietary interventions, physical activity, inflammation, pain, fertility, and quality of life in women with endometriosis. A total of 30 studies were included in the final review based on their relevance to the research question and methodological quality.

3. Results

3.1. Endometriosis and inflammation: pathophysiological mechanisms

Endometriosis is characterized by chronic inflammation, in which cytokines play a central role in cell proliferation and differentiation. These cytokines influence survival, growth, differentiation, invasion, angiogenesis, and immune escape, thereby contributing to disease progression and impaired fertility. Furthermore, pro-inflammatory and anti-inflammatory cytokines may serve as biomarkers or potential therapeutic targets in endometriosis. (2)

The pathophysiology of endometriosis involves multiple factors, including hormonal, immunological, genetic, and environmental components, with chronic inflammation playing a central role in disease development and progression. Similarly to malignant processes, endometriotic tissue is capable of spread, invasion, organ damage, and neoangiogenesis. (2)

Elevated estrogen levels trigger bleeding in ectopic lesions, leading to the secondary release of pro-inflammatory cytokines, including IL-1 β , IL-6, IL-10, IL-17, and VEGF, as well as iron overload and infiltration of monocytes and macrophages, which stimulate lipid peroxidation and accumulation of malondialdehyde (MDA). Both iron overload and lipid peroxidation contribute to the production of reactive oxygen species (ROS), ultimately resulting in oxidative stress, which plays a central role in pain generation and disease progression. (2)

Endometrial mesenchymal stem cells (eMSCs) and epithelial progenitors (eEPs) adhere to peritoneal surfaces and proliferate and differentiate into ectopic tissue through aberrant adhesion molecules, inflammatory cytokines, and molecular pathways such as PI3K/Akt and Wnt/ β -catenin. These pathways promote cell proliferation, angiogenesis, and resistance to apoptosis, thereby facilitating the establishment and maintenance of endometriotic lesions. Furthermore, immune dysregulation characterized by impaired macrophage activity and

decreased NK cell function promotes chronic inflammation and contributes to the persistence of ectopic lesions. Pain in endometriosis is mediated by prostaglandin E2 (PGE2) and neural infiltration of ectopic lesions, highlighting the need for targeted pain management strategies. (3)

Oxidative stress, defined as an imbalance between reactive oxygen species (ROS) and antioxidants, triggers inflammatory responses in the peritoneal cavity. ROS, as byproducts of oxygen metabolism, act as inflammatory mediators that modulate cell proliferation and exert harmful effects on cellular structures. Endometriosis is associated with elevated ROS levels, decreased antioxidant capacity, impaired detoxification enzymes, and dysregulation of iron metabolism, contributing to inflammation, extracellular matrix degradation, angiogenesis, and cell proliferation. (4) (5) (6)

Collectively, these mechanisms suggest that hormonal dysregulation and immune dysfunction create a self-perpetuating inflammatory environment that drives the progression of endometriosis, contributing to chronic pain, impaired fertility, and reduced quality of life.

3.2. Dietary patterns and inflammation in endometriosis

Dietary patterns may have a significant impact on the inflammatory processes underlying endometriosis, thereby influencing pain perception. Diet can both exacerbate and attenuate inflammation through modulation of free radical levels, estrogen concentrations, and sex hormone-binding globulin (SHBG). Diets rich in antioxidants, polyunsaturated fatty acids (PUFAs), and vitamins D, C, and E — alongside the avoidance of processed foods, red meat, and animal fat — may modify disease progression and improve quality of life in affected patients. (7–10)

The Mediterranean diet, characterized by high intake of vegetables, fruits, legumes, seeds, and nuts, with moderate consumption of dairy products and fish, and limited red meat, has been shown to reduce proinflammatory mediators, thereby alleviating pain and potentially slowing disease progression. Moreover, this dietary approach may serve as an alternative or complementary strategy for patients in whom hormonal therapy is contraindicated, as well as for those with early-stage endometriosis (stages I–II according to the ASRM classification), particularly when long-term hormonal side effects — including those affecting fertility — are of concern. (7–9)

Women with endometriosis have a two- to threefold higher risk of receiving an IBS diagnosis compared to unaffected women. Both conditions share a common underlying pathophysiology characterized by chronic low-grade inflammation and overlapping clinical manifestations. In a

study involving 160 women with IBS, Moore et al. reported significantly greater symptom improvement among participants with both IBS and endometriosis following a low-FODMAP diet compared to those with IBS alone (72% vs. 40%; $p = 0.001$). Following six months on a low-FODMAP diet, women with endometriosis reported reduced pain and improved quality of life. Furthermore, after three months, significant improvements were observed in chronic pelvic pain, dysmenorrhea, and both intestinal and extraintestinal symptoms. (7–9,11)

Dysbiosis, via disruption of the estrobolome, may lead to increased circulating estrogen levels, thereby sustaining ectopic endometrial tissue growth. A diet rich in fiber and polyphenols may restore microbial balance and reduce systemic inflammation, thereby limiting disease progression. (7,8,12–14)

3.3 Impact of diet on pain in endometriosis

In a single-arm study conducted in Austria, Ott et al. examined the influence of the Mediterranean diet on endometriosis-associated pain in 68 women with a previous laparoscopic diagnosis of endometriosis. Pain was assessed using the Numeric Rating Scale (NRS). Following adherence to the dietary regimen, a significant relief of general pain, dysmenorrhea, dyspareunia, and dyschezia was observed, alongside an improvement in overall quality of life. (15)

In a randomized controlled trial conducted in Italy, Sesti et al. compared hormonal suppression therapy and dietary supplementation — consisting of omega-3/6 fatty acids, vitamins B6, A, C, and E, and mineral salts — in patients with stages III–IV endometriosis following laparoscopic surgery. Both interventions were equally effective in reducing non-menstrual pelvic pain over a six-month period. (15–17)

Selected dietary components, including vitamins and micronutrients, have also been shown to contribute to the management of endometriosis through their potential effects on inflammation, oxidative stress, and hormonal regulation. (18,19)

In a double-blind randomized controlled trial conducted in Iran, 40 patients with rASRM stages III–IV endometriosis received vitamin D supplementation (50,000 IU weekly) or placebo for 12 weeks following laparoscopic surgery. Pain severity was assessed using the Visual Analogue Scale (VAS); however, no significant effect of vitamin D on dysmenorrhea or pelvic pain outcomes was demonstrated at 24 weeks post-laparoscopy. (15–17)

According to the systematic review by Kalaitzopoulos et al., the positive effects of vitamin D supplementation appear to be limited mainly to women with confirmed vitamin D deficiency. (20)

Omega-3 fatty acids may modulate prostaglandin synthesis and inflammatory pathways involved in pain generation. By influencing prostaglandin activity, omega-3 fatty acids may contribute to a more anti-inflammatory environment and potentially alleviate endometriosis-associated pain. (20,21)

Overall, the evidence suggests that diet may help relieve pain associated with endometriosis, although the quality of the evidence is low and more randomized controlled trials are needed. (15–17)

3.4. Impact of diet on fertility in endometriosis

N-acetylcysteine (NAC), a supplement with antioxidant and anti-inflammatory properties, has shown promising results in women with endometriosis and ovarian endometriomas. In a prospective study of 120 women, NAC administered at 600 mg three times daily for three consecutive days per week for 3 months was associated with a significant reduction in endometrioma size and pain symptoms. Notably, among 52 women with reproductive desire, 39 (75%) achieved spontaneous pregnancy within 6 months of treatment initiation $p=0.001$. (22,23)

Endometriosis affects 35 to 45% of women with infertility, primarily through chronic inflammation which impairs decidualisation, reducing the likelihood of conception. Dietary interventions with anti-inflammatory properties may improve fertility outcomes through reduction of oxidative stress and inflammation, although their direct impact on pregnancy rates remains unclear. Nevertheless, adherence to an anti-inflammatory diet represents a low-risk adjunctive strategy that may reduce the need for more invasive interventions. (24)

A diet high in dietary fiber has been shown to reduce circulating estrogen concentrations by 10–25%, which may be particularly beneficial in endometriosis, as it is an estrogen-dependent disease. Additionally, plant-based diets increase plasma concentrations of sex hormone-binding globulin (SHBG), thereby reducing estrogen activity and potentially alleviating endometriosis-related symptoms. A low-glycaemic index diet has been associated with a reduced risk of endometriosis, while seaweed consumption has demonstrated an inverse relationship with serum estradiol concentrations, suggesting additional estrogen-modulating potential. (14,25)

Resveratrol, a natural polyphenol found in grapes and red wine, has demonstrated anti-inflammatory and anti-angiogenic properties, suggesting its potential role in limiting the progression of endometriotic lesions. (26)

Dietary interventions may support fertility in women with endometriosis through modulation of estrogen levels and inflammatory pathways; however, further randomized controlled trials are needed to establish clear clinical recommendations. (24,25,27)

3.5. Impact of diet and physical activity on quality of life in endometriosis

Endometriosis is associated with significantly impaired quality of life, including elevated rates of depressive and anxiety symptoms. (28)

Dietary interventions represent a valuable complementary approach alongside conventional pharmacological and surgical treatments for endometriosis. Lifestyle modifications, including adherence to anti-inflammatory dietary patterns, may modulate inflammation, reduce oxidative stress and alleviate symptoms, thereby improving overall quality of life in affected women. (22)

In a retrospective study involving 207 women with severe endometriosis, 12-month adherence to a gluten-free diet resulted in significant pain reduction in 75% of participants, with parallel improvements in physical and social functioning as measured by the SF-36 quality of life questionnaire. (22) However, the quality of evidence supporting the gluten-free diet in endometriosis remains low, and its routine recommendation without confirmed celiac disease is not advised. (29)

Physical activity represents another valuable non-pharmacological strategy in the management of endometriosis. Regular exercise may reduce systemic inflammation, alleviate pain and improve overall well-being in affected women. (30)

Beyond dietary interventions, mind-body practices have also demonstrated measurable improvements in quality of life in women with endometriosis. In an 8-week Hatha yoga programme involving 40 women, significant reductions in pain (VAS $p < 0.001$) and improvements in quality of life (EHP-30) were reported. Similarly, a 12-week progressive muscle relaxation programme conducted in 100 women showed significant reductions in pain, anxiety and depression, alongside improved SF-36 scores ($p < 0.05$). (22)

Overall, dietary interventions and lifestyle modifications may significantly improve quality of life in women with endometriosis as a complementary approach to conventional treatment. (22,24,25)

4. Discussion

This scoping review examined the role of diet in modulating inflammation, pain, fertility, and quality of life in women with endometriosis. The available evidence indicates that dietary interventions may positively influence these outcomes, highlighting the potential of nutritional strategies as adjunctive tools in the management of the disease.

Overall, dietary interventions appear to alleviate pain associated with endometriosis, although the quality of the evidence remains low and further randomized controlled trials are needed. Dietary interventions may also support fertility in women with endometriosis through modulation of estrogen levels and inflammatory pathways; however, large-scale randomized controlled trials are needed to establish clear clinical recommendations. Moreover, dietary interventions and lifestyle modifications may significantly improve quality of life in women with endometriosis as a complementary approach to conventional treatment.

The findings of this scoping review also emphasize the importance of adopting a multidisciplinary approach to the management of endometriosis. Although pharmacological and surgical treatments remain the cornerstone of therapy, lifestyle interventions may represent an important complementary strategy that empowers patients to actively participate in disease management. Individualized dietary counselling, regular physical activity, psychological support, and patient education may together contribute to better symptom control and improved long-term quality of life. Such an approach may be particularly valuable for women experiencing persistent pain, fatigue, or reduced daily functioning despite conventional treatment.

Physical activity may represent an important complementary component of lifestyle-based management in women with endometriosis. Available evidence suggests that regular exercise may contribute to pain reduction, improved physical functioning and better quality of life, although the optimal type, intensity and frequency of exercise remain unclear. Exercise-based interventions should therefore be considered as part of an individualized multidisciplinary approach rather than as a replacement for conventional pharmacological or surgical treatment. Further randomized controlled trials are needed to establish standardized recommendations for physical activity in women with endometriosis.

It should also be acknowledged that patient adherence to dietary interventions may vary considerably depending on socioeconomic status, cultural dietary habits, food availability, and individual motivation. These factors may partly explain the heterogeneous outcomes observed across studies and highlight the importance of personalized nutritional recommendations rather than universal dietary protocols. Future studies should therefore evaluate not only the efficacy of specific dietary patterns but also strategies to improve long-term adherence and patient engagement.

At the mechanistic level, dysbiosis - via disruption of the estrobolome - may lead to increased circulating estrogen levels, thereby sustaining ectopic endometrial tissue growth. A diet rich in fiber and polyphenols may restore microbial balance and reduce systemic inflammation,

thereby limiting disease progression. Collectively, these mechanisms suggest that hormonal dysregulation and immune dysfunction create a self-perpetuating inflammatory environment that drives the progression of endometriosis, contributing to chronic pain, impaired fertility, and reduced quality of life.

Several limitations of the included studies should be acknowledged. First, many studies were characterized by small sample sizes, which limits the generalizability of the findings. Second, the methodological heterogeneity - encompassing RCTs, single-arm studies, and retrospective designs - makes direct comparisons between studies difficult. Third, most interventions were of short duration, typically ranging from weeks to a few months, which precludes conclusions about long-term effects. Finally, the included studies enrolled women with varying stages of endometriosis, further limiting the comparability of results across studies.

Despite these limitations, this scoping review has several important strengths. It synthesizes recent evidence published between 2017 and 2026, integrating findings from systematic reviews, randomized controlled trials, prospective studies, and narrative reviews. Another strength is the integration of evidence from multiple complementary domains, including nutrition, physical activity, reproductive outcomes, and quality of life. This broad perspective reflects the multifactorial nature of endometriosis and may facilitate a more holistic understanding of disease management. By combining evidence on dietary patterns, nutritional supplementation, physical activity, inflammation, fertility, pain, and quality of life, this review provides a comprehensive overview of the potential role of lifestyle interventions in endometriosis management. Furthermore, highlighting both clinical outcomes and underlying biological mechanisms may facilitate the translation of current evidence into everyday clinical practice and support future research in this field. This comprehensive synthesis may also help identify current knowledge gaps and support the design of future multidisciplinary studies investigating lifestyle interventions in women with endometriosis.

From a clinical perspective, dietary counselling should be considered as part of a comprehensive, individualized management plan rather than a replacement for pharmacological or surgical treatment. Collaboration between gynecologists, dietitians, physiotherapists, and mental health professionals may improve patient adherence and facilitate long-term symptom management. Such multidisciplinary care may also help address the complex biopsychosocial aspects of endometriosis, ultimately improving patient satisfaction and overall quality of life.

In primary care, patients with endometriosis may be encouraged to adopt an anti-inflammatory dietary pattern, particularly the Mediterranean diet. Selected nutritional supplements, including omega-3 and omega-6 fatty acids, selected vitamins (A, B6, C and E) and mineral compounds,

have been investigated for their potential effects on symptom control; however, current evidence remains insufficient to support routine supplementation in all patients. In addition to dietary modifications, lifestyle-based approaches, including regular physical activity, yoga and progressive muscle relaxation, may contribute to pain reduction, improved psychological well-being, and enhanced quality of life.

Regular follow-up may be beneficial to evaluate symptom improvement, treatment adherence, nutritional status, and potential nutritional deficiencies associated with restrictive dietary patterns. Collaboration between primary care physicians, gynecologists, and dietitians may facilitate individualized recommendations while minimizing the risk of unnecessary dietary restrictions that could adversely affect nutritional status and overall health.

Future research should focus on large-scale, long-term randomized controlled trials with standardized dietary protocols and homogeneous patient populations, stratified by endometriosis stage. Further investigation into the role of the gut microbiome and estrobolome in disease progression may provide novel therapeutic targets. Additionally, studies examining the combined effect of dietary and lifestyle interventions on pain, fertility and quality of life are warranted.

Future investigations should also explore the effectiveness of personalized nutritional interventions based on disease phenotype, hormonal status, gut microbiome composition, and metabolic profile. The use of standardized outcome measures assessing pain, fertility, inflammatory biomarkers, and quality of life would improve comparability across studies and facilitate the development of evidence-based clinical guidelines.

5. Conclusions

The findings of this scoping review suggest that dietary patterns and physical activity may modulate inflammation and thereby influence pain, fertility and quality of life in women with endometriosis. Dietary interventions may exert their effects through modulation of hormonal regulation, reduction of pro-inflammatory mediators, and restoration of estrobolome balance, thereby limiting disease progression. However, the quality of the available evidence remains limited, and further large-scale, long-term randomized controlled trials with standardized protocols and larger patient populations are needed to establish clear clinical recommendations.

Disclosure

Author Contributions

Conceptualization, J.K., D.O., N.P.; Methodology, J.K.; Investigation, J.K., M.B., K.Ś., W.Z., A.K.; Writing - Original Draft Preparation J.K., L.S., O.D.; Writing - Review and Editing, J.K., W.W., A.J. All authors have read and agreed to the published version of the manuscript.

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During the preparation of this work, the authors used AI-assisted language tools (including Claude and ChatGPT) for language editing, improvement of scientific English, and verification of bibliographic formatting. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the substantive content of the publication.

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