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The impact of diet and physical activity on reducing inflammation in endometriosis

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Abstract:
Introduction: Endometriosis is a chronic condition where tissue similar to the endometrium grows outside the uterine cavity, leading to pain, inflammation, and fertility issues. Its manifestations can affect various systems and organs. In recent years, there has been growing interest in the impact of diet and physical activity on alleviating pain associated with endometriosis.

Purpose of the work: The aim of this paper is to review the latest knowledge regarding endometriosis and its systemic manifestations in the body. Endometriosis can contribute to changes in the microbiome, affect metabolism in the liver and adipose tissue, and may significantly impact women's mental health.

Materials and methods: We conducted a literature review from 1993 to 2024 available in the PubMed database using the keywords: "endometriosis", "inflammatory disease", "microbiome", "diet", "physical activity "

Results: The discussed studies indicate a clear correlation between endometriosis and the development of systemic inflammation, changes in the microbiome, and an increased risk of depression. Moreover, studies indicate that physical activity and the consumption of certain foods can influence the level of inflammation in the body, which in turn may reduce pain symptoms. A thorough examination of this issue will lead to a better understanding of the nature of endometriosis and enable the discovery of new treatment strategies.

Keywords: endometriosis; inflammatory disease; microbiome; diet; physical activity

Introduction

Endometriosis is a medical condition characterized by the growth of tissue similar to the endometrial lining of the uterus (endometrium) outside the uterine cavity. This ectopic tissue can develop on various pelvic organs, including the ovaries, fallopian tubes, and the surface of the uterus, as well as on organs outside the pelvis like the intestines and lung [1,2]. Symptoms of endometriosis can differ based on the severity of the disease and the locations of the abnormal tissue. Common symptoms include menstrual pain, pain during intercourse (dyspareunia), irregular menstrual cycles, and infertility issues. Recent research indicates that endometriosis is a chronic systemic disease with effects on the gut microbiome, liver metabolism, and neurological changes [3,4]. A thorough medical history, imaging studies, and laparoscopy—the

"gold standard" for diagnosis—are used to diagnose endometriosis. Treatment options encompass both pharmacological and surgical approaches [5]. Furthermore, diet and physical activity play a significant role in alleviating pain symptoms in women with endometriosis. Consuming anti-inflammatory foods and avoiding those that can exacerbate inflammation may help reduce symptoms. Regular physical activity contributes to the improvement of overall health and well-being [6, 7].

Epidemiology

Endometriosis is one of the most prevalent gynecological disorders, affecting an estimated 10% of women of reproductive age [1]. Nearly 50% of women with reproductive disorders and pelvic pain also have endometriosis. The condition predominantly affects younger women, with the highest incidence occurring between ages 25 and 45 [8].

Pathogenesis

Several theories have been proposed to explain the pathogenesis and development of endometriosis:

1. Endometrial Transplantation Theory: This theory suggests that menstrual endometrial cells may retrogradely migrate through the fallopian tubes into the peritoneal cavity. In women with weakened immune systems, these cells might survive outside the uterus and implant elsewhere, leading to disease symptoms [5, 8].
2. Metaplasia Theory: According to this theory, undifferentiated cells can transform into endometrial-like cells, leading to the development of lesions, potentially influenced by hormonal and inflammatory factors [8].
3. The role of adenogenesis in endometriosis: The involvement of adenogenetic factors in the pathogenesis of endometriosis is becoming increasingly significant [8].

Risk factors for developing endometriosis include developmental defects associated with abnormal menstrual blood flow, shortened menstrual cycles, prolonged exposure to endogenous estrogens (e.g., early onset of menstruation, late menopause, obesity), and exposure to dioxin [8, 9].

Symptoms

Symptoms of endometriosis can significantly vary among individuals. While some may be asymptomatic, others might experience severe menstrual pain (dysmenorrhea), irregular cycles, painful intercourse, or fertility challenges. Endometriosis is a leading cause of infertility, with significant reproductive implications. A study by Vered H. Eisenberg et al. (2022) found that infertility was present in 36.9% of women diagnosed with endometriosis, with a rate of 49.9% in women aged 40-44 [10].

Endometriosis and the Microbiome

Emerging research suggests a potential link between the microbiota, the diverse community of microorganisms in our bodies, and endometriosis. While the exact nature of this relationship remains unclear, some evidence suggests that dysbiosis—changes in microbiome composition—may influence inflammation and immune responses related to endometriosis [11, 12]. For instance, Bailey MT et al. (2002) discovered that the gut microbiota levels in rhesus macaques with endometriosis were altered, showing lower concentrations of lactic acid bacteria but higher concentrations of Gram-negative bacteria. Additionally, individuals with pelvic inflammatory disease (PID) were three times more likely to develop endometriosis, as shown in a study by Tai FW (2018) [11]. The gut microbiome can also impact estrogen metabolism, potentially affecting the progression of endometriosis [13]. Gastrointestinal symptoms are frequently reported by those with endometriosis, further underscoring the microbiota's potential role [14].

Endometriosis and Irritable Bowel Syndrome (IBS)

Endometriosis and IBS, while distinct conditions, often coexist, complicating diagnosis and treatment. IBS is marked by abdominal pain and altered bowel habits, including diarrhea and constipation. The causes of IBS remain largely enigmatic but may involve factors such as intestinal hypersensitivity, gut microbiota alterations, stress, and genetics [15, 16]. Women with endometriosis are at higher risk of developing IBS, with overlapping symptoms leading to potential misdiagnosis. A study by Aupeti A. et al. (2022) demonstrated that one in four women report symptoms related to IBS. Abdominal pain, bloating, and bowel movement issues can be common symptoms of both conditions. The coexistence of these disorders may lead to

misdiagnosis, as symptoms might be mistakenly attributed to only one of the conditions. Therefore, a holistic approach is crucial in the care of these patients [15, 16].

Endometriosis and Depression

Both endometriosis and depression significantly affect daily functioning and often coexist, indicating a complex interplay between them. Research has shown that women with endometriosis have a heightened likelihood of experiencing depressive symptoms [17]. This association may be due to elevated levels of pro-inflammatory cytokines, which can compromise the blood-brain barrier, activate neuroinflammation, and contribute to brain cell apoptosis, leading to depression [18]. The study conducted by Low WY et al. (1993) found that patients with endometriosis are significantly more likely to experience anxiety and depression. These findings suggest that endometriosis, a chronic condition, not only affects physical health but also has significant implications for the mental health of patients. The high levels of pain, difficulties in daily functioning, and issues related to fertility may contribute to the development of mental health disorders such as anxiety and depression. This underscores the need for comprehensive care for patients with this condition, including both medical and psychological support [17, 19].

Diagnosis

Diagnosis of Endometriosis is a multi-step process that often requires a thorough medical history, physical examinations, and specialized tests.

1. Medical History

- Symptoms: The doctor begins by gathering detailed information about the patient's symptoms. The most common symptoms of endometriosis include pelvic pain, painful periods (dysmenorrhea), pain during intercourse (dyspareunia), fertility issues, and pain during urination or bowel movements.
- Medical History: It is also important to discuss the patient’s medical history, including previous gynecological surgeries, family history of endometriosis, and other gynecological conditions.

2. Physical Examination

- Pelvic Examination: The doctor may perform a pelvic exam to check for any abnormalities, such as nodules, adhesions, or other signs of endometriosis. Unfortunately, early stages of the disease may not show clear signs during a physical exam [5, 20].

3. Imaging Tests

- Ultrasound (USG): This is the most commonly performed imaging test. Ultrasound can help detect endometrial cysts (known as chocolate cysts) in the ovaries. However, endometriosis lesions outside the ovaries may be difficult to visualize.
- Magnetic Resonance Imaging (MRI): MRI can be used for a more detailed visualization of endometriosis lesions, especially in more advanced cases or when deep infiltrating endometriosis is suspected.

4. Laparoscopy

- Gold Standard: Laparoscopy is a minimally invasive surgery that allows the doctor to directly view the inside of the abdomen and pelvis. It is the most reliable diagnostic method, which not only confirms the presence of endometriosis but also allows for the removal or biopsy of affected tissues.
- Biopsy: During laparoscopy, tissue samples can be taken for histopathological examination, which provides a definitive diagnosis [20, 22].

Although no specific blood tests can definitively diagnose endometriosis, elevated CA-125 levels may occur in affected women, although this marker is not specific and may be present in other conditions [21].

Treatment

Treatment strategies for endometriosis depend on symptom severity, patient age, and reproductive plans, and may include pharmacological and surgical options.

Pharmacological Treatment: Often includes hormonal therapies and pain relief measures.

Hormonal Therapy: Common hormonal treatments involve oral contraceptive pills (OCPs), estrogen-progestin combinations, progestogens, and gonadotropin-releasing hormone (GnRH) analogs. OCPs are first-line treatments aimed at inhibiting ovulation and reducing inflammation.

However, about 25% of patients may not respond, experiencing various side effects like irregular bleeding and nausea [22-24].

GnRH Analogs: Used as second-line therapy, they suppress hormone release, leading to lower estrogen levels. Long-term use can lead to hypoestrogenism, which may result in osteoporosis [20,22].

Progestogens: These have anti-proliferative effects that can reduce endometriosis lesions and alleviate pain [24].

Relationship between diet and endometriosis

Diet plays a key role in managing the symptoms of endometriosis. A well-balanced diet can help alleviate inflammation, which may, in turn, reduce pain. Anti-inflammatory foods include leafy vegetables, fatty fish (rich in omega-3 fatty acids), nuts, and olive oil. Omega-3 fatty acids have anti-inflammatory properties, which can be particularly beneficial for women with endometriosis [6, 25]. A study conducted by M. Cirillo et al. (2023) on a group of 35 women found that the Mediterranean diet significantly reduces pain in patients with endometriosis. Additionally, it is advisable to avoid foods that may exacerbate inflammation. Such foods include processed foods, simple sugars, trans fats, and red meat. Research suggests that a diet rich in these components may worsen endometriosis symptoms, including pain [26].

Relationship between physical activity and endometriosis

Physical activity is another important element in managing pain associated with endometriosis. Regular exercise can bring many benefits in terms of pain relief. Physical exercises, especially those of moderate intensity, can help reduce pain. A study conducted by Gonçalves AV et al. (2017) involved two groups of 40 women. The first group, consisting of 28 women, practiced yoga twice a week for 8 weeks. The second group, consisting of 12 women, did not practice yoga. The degree of pain was assessed using a visual analog scale. In the first group, the exercises produced the desired effects, as a significant decrease in pain was observed [7].

Conclusion

Endometriosis is not just a gynecological condition but also a state that affects the entire body. Although it is most commonly associated with gynecological symptoms such as pelvic pain and infertility, studies show that it may be linked to other conditions like irritable bowel syndrome (IBS) and depression. Although diet and physical activity are not a cure for endometriosis, they can provide valuable support in alleviating pain symptoms. Understanding endometriosis as a systemic disease is crucial for effective treatment and improving the quality of life for patients.

Disclosures

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