



Nutritional and lifestyle procedures to reduce symptoms associated with dysbiosis in women

Procedimientos nutricionales para reducir los síntomas asociados a la disbiosis en la mujer

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Abstract: The main objective of this research is to evaluate the impact of food and nutritional education strategies on symptoms associated with intestinal dysbiosis in women. For the methodological search, a qualitative research approach was conducted, of the integrative literature review type. Data collection took place in scientific databases: LILACS and PUBMED. The results obtained suggest that food and nutritional education plays a crucial role in modulating the intestinal microbiota. Nutritional education strategies can provide women with information about how to choose foods rich in fiber, prebiotics and probiotics, which promote intestinal health. Nutritional guidance can help women avoid processed foods high in sugar and saturated fat, which are known to harm the microbiota. However, adopting a balanced and healthy diet, under the supervision of healthcare professionals, can be an effective tool in improving symptoms associated with intestinal dysbiosis in women.

Keywords: *Dysbiosis; Treatment; Nutrition, Strategies, Lifestyle.*

Resumen: El objetivo principal de esta investigación es evaluar el impacto de las estrategias de educación alimentaria y nutricional sobre los síntomas asociados a la disbiosis intestinal en mujeres. Para la búsqueda metodológica, se realizó un abordaje de investigación cualitativa, del tipo revisión bibliográfica integradora. La recolección de datos se realizó en las bases de datos científicas LILACS y PUBMED. Los resultados obtenidos sugieren que la educación alimentaria y nutricional desempeña un papel crucial en la modulación del microbiota intestinal. Las estrategias de educación nutricional pueden proporcionar a las mujeres información sobre cómo elegir alimentos ricos en fibra, prebióticos y probióticos, que promueven la salud intestinal. La orientación nutricional puede ayudar a las mujeres a evitar los alimentos procesados ricos en azúcar y grasas saturadas, que se sabe que dañan el microbiota. Sin embargo, la adopción de una dieta equilibrada y saludable, bajo la supervisión de profesionales sanitarios, puede ser una herramienta eficaz para mejorar los síntomas asociados a la disbiosis intestinal en las mujeres.

Palabras clave: *Disbiosis; Tratamiento; Nutrición, Estrategias, Estilo de vida.*

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INTRODUCTION

The intestinal microbiota is a complex microbial ecosystem that inhabits the human gastrointestinal tract. It is made up of a vast diversity of microorganisms, including bacteria, viruses, fungi and archaea, and the gut microbiota plays a fundamental role in maintaining the health and proper functioning of the human body. Recent studies have revealed the importance of this microbial community in regulating the immune system, nutrient metabolism, vitamin production, cognitive development and even mood and behavior (Chuluck *et al.*, 2014).

The influence of the gut microbiota goes beyond the gastrointestinal tract, extending to various diseases such as obesity, diabetes, inflammatory bowel diseases and even neuropsychiatric disorders. Given these findings, understanding the complexity and interaction between intestinal microorganisms has become an ever-expanding field of research (Machado *et al.*, 2022).

Modification of the microbiota and the functions performed by microorganisms has the potential to significantly affect digestive and fermentative processes and their products, as well as the control of agents that cause pathologies. In addition, these changes can impair the balance of the gut-brain axis, resulting in increased intestinal permeability and favoring the translocation of pathogens and toxins that stimulate systemic and local inflammatory processes (Silva *et al.*, 2018).

Recent studies have highlighted gender differences in the composition and function of the gut microbiota, which may have specific implications for women's health (Tamboli *et al.*, 2020). In relation to gut dysbiosis in women, recent studies have provided evidence that hormonal factors can play a significant role in modulating the gut microbiota. For example, the menstrual cycle and menopause are physiological events that are associated with important hormonal changes and can affect the composition of the gut microbiota (Suez *et al.*, 2020). In addition, hormone therapy used in certain medical conditions can also have an impact on the female gut microbiota (Baothman *et al.*, 2016).

Intestinal dysbiosis in women can be triggered by various factors, including stress, medication, excessive use of antibiotics, lack of sleep and an inadequate diet. Diet is a key factor in promoting intestinal health. Adequate intake of nutrients, fiber and water are fundamental for the proper functioning of the gastrointestinal tract in women as well (Gibson *et al.*, 2017).

Eating foods rich in fiber, probiotics and prebiotics can help promote intestinal health. In addition, it is essential to seek advice from health professionals before taking any medication or supplement that could affect the gut microbiota (Bernaud *et al.*, 2013). Recent studies have shown that a diet rich in fiber, such as fruits, vegetables, whole grains and legumes, promotes microbial diversity and improves intestinal health (Sonnenburg *et al.*, 2016). On the other hand, the Western diet, which is characterized by

excessive consumption of ultra-processed foods, rich in refined sugars and saturated fats, can lead to negative changes in the gut microbiota (Louzada *et al.*, 2015).

In addition to diet, lifestyle also has an important influence on intestinal health. Regular physical exercise has been associated with greater microbial diversity and the promotion of beneficial bacteria in the gut (Mailing *et al.*, 2019). On the other hand, chronic stress, lack of adequate sleep and indiscriminate use of antibiotics can contribute to an imbalance in the gut microbiota (Conrado *et al.*, 2018).

Thus, the increasing prevalence of intestinal dysbiosis in women highlights the importance of identifying its causes and consequences to minimize suffering and improve quality of life. Thus, exploring strategies that improve dysbiosis becomes essential, in this context, to analyze the importance of food and nutritional education strategies associated with improved quality and lifestyle can be alternatives in the management of dysbiosis, favoring a balanced intestinal environment and overall health improvement. To this end, the main objective of this study is to evaluate the impact of food and nutrition education strategies on the symptoms associated with intestinal dysbiosis in women.

THEORETICAL BACKGROUND

Intestinal microbiota: Concept, composition and functions

The evolution of the gut microbiota is also related to human evolution. The gut microbiota is believed to have evolved over time in response to changes in the human diet and selective pressures from the environment (Ley *et al.*, 2008). For example, the introduction of fermented foods into the human diet may have led to an increase in the diversity of the gut microbiota (Ou *et al.*, 2020).

And so, in a healthy way, the intestinal microbiota forms a barrier against invading microorganisms, enhancing the host's defense mechanisms against pathogens, and thus improving intestinal immunity by adhering to the mucosa and stimulating local immune responses. In addition, it competes for intraluminal fuels, preventing the establishment of pathogenic bacteria (Mathai *et al.*, 2002).

Characterization of intestinal dysbiosis

Dysbiosis is a disorder characterized by a dysfunction in the colonization of intestinal microorganisms, where there is a predominance of pathogenic bacteria over beneficial bacteria, affecting the balance of the intestinal microbiota. This alteration in intestinal eubiosis can result in various health problems for the host, including poor digestion of nutrients due to altered enzyme production, limiting the ability to absorb nutrients, as well as making it difficult to control disease-causing agents (Nesi *et al.*, 2021).

Several factors are causes of dysbiosis, such as the abuse of medications, especially antibiotics, laxatives, ultra-processed food intake, exposure to xenobiotics, pH, intestinal flow and the individual's immune status. Intestinal constipation, flatulence and abdominal distension are its main symptoms and a medical assessment together with a nutritional assessment are essential for its treatment and investigation (Barroso et al., 2022).

The intestinal microbiota is characterized using DNA sequencing techniques, such as real-time PCR and next-generation sequencing (NGS). These techniques make it possible to identify the bacterial species present in the gut microbiota and quantify their relative abundance. In addition, RNA sequencing is used to assess the metabolic activity of the gut microbiota, providing information on the metabolic pathways used by the bacteria and the satisfactions between them (Hillmann et al., 2018).

Intestinal dysbiosis in women

Intestinal dysbiosis is characterized by an imbalance in the intestinal microbiota, with an increase in pathogenic bacteria and a reduction in beneficial bacteria in the gut. This imbalance can lead to various conditions, such as irritable bowel syndrome, inflammatory bowel diseases, obesity, diabetes, among others. In this context, studies have shown that women may be more vulnerable to intestinal dysbiosis than men, due to hormonal and behavioral factors (Moreno et al., 2016).

Recently, studies have shown that female sex hormones, such as oestrogen and progesterone, play an important role in regulating the composition of the gut microbiota. The menstrual cycle is characterized by hormonal fluctuations that can affect the composition and function of the gut microbiota. Recent studies have found that the level of oestrogen and progesterone is associated with the composition of the gut microbiota in women of reproductive age (Markle et al., 2013; Souza et al., 2020). In addition, changes in the gut microbiota can affect the menstrual cycle and increase the risk of menstrual disorders such as premenstrual syndrome and endometriosis (Yang et al., 2020).

The use of oral contraceptives is common among women of reproductive age and has been associated with changes in the gut microbiota. Some studies have reported that the use of oral contraceptives can decrease microbial diversity and increase the risk of gut dysbiosis in women (Huang et al., 2019; Panduru et al., 2020).

Intestinal dysbiosis has been associated with various health conditions in women, including gastrointestinal disorders, autoimmune diseases and even psychiatric disorders. Studies show that women with irritable bowel syndrome (IBS) have a change in the composition of their gut microbiota, with a lower proportion of bacterial bacteria and a higher proportion of pathogenic bacteria compared to healthy women (Ringel et al., 2015).

Nutritional strategies for controlling intestinal dysbiosis in women

Diet is one of the main factors that influence the composition of the intestinal microbiota. A diet rich in fiber, fruits, vegetables and legumes favors the growth of beneficial microorganisms, while a diet rich in sugars, saturated fats and processed foods favors the growth of pathogenic microorganisms (Filippis et al., 2016).

Furthermore, nutrition plays an important role in modulating the intestinal microbiota. Some nutrients, such as short-chain fatty acids (SCFA), produced by the fermentation of fibers by the intestinal microbiota, have beneficial effects on intestinal health. On the other hand, nutrient deficiencies, such as vitamins and minerals, can compromise intestinal health and favor the development of dysbiosis (Moraes et al., 2014)

Fibers are important because they are not digested by the human body, but by intestinal microorganisms, which produce short-chain fatty acids (SCFA), substances that are used by colon cells as a source of energy. Additionally, fiber helps reduce intestinal inflammation and increase microbial diversity, factors that contribute to the prevention of dysbiosis (Song et al., 2020).

Another important aspect of the diet is consuming fermented foods such as yogurt, kefir, sauerkraut and kimchi. These foods contain beneficial bacteria that help balance the intestinal microbiota and reduce inflammation (Fidel et al., 2020). Furthermore, supplementation with probiotics may be an effective strategy for treating intestinal dysbiosis in women. Studies show that probiotic supplementation can improve microbial diversity and reduce intestinal inflammation in women with dysbiosis (Gomes et al., 2018).

Another important aspect of food and nutritional education for women with intestinal dysbiosis is reducing the consumption of inflammatory foods, such as sugars, saturated fats and processed foods. These foods can increase intestinal inflammation and compromise the health of the intestinal microbiota (Costa et al., 2020). Furthermore, excessive alcohol consumption can harm the health of the intestinal microbiota and increase the risk of dysbiosis (Santana et al., 2023).

METHODOLOGY

The methodological technique used in this research was a qualitative approach, by means of an integrative review of the literature, conducted between the time of studies published in the last ten years on different platforms, with searches being conducted using the keywords of the subject under study. Descriptive research expresses the desire to get to know certain relationships, characteristics and problems, requiring the researcher to provide as much information as possible about what they wish to research (Goulart, 2006).

To achieve eligible results, a bibliographic survey was conducted between August and September in scientific databases: The searches in the scientific literature were conducted in the databases: Latin American and Caribbean Literature in Health Sciences - LILACS and National Library of Medicine - PUBMED. The following descriptors were used: Dysbiosis, Treatment and Nutrition using the Boolean expression "AND" to combine two or more keywords.

Studies published between 2013 and 2023 were included, with the central theme of dysbiosis and food and nutrition education strategies. Also included were studies available in full, published in English and Portuguese, and those that met the objective in question. Exclusion criteria were review articles, incomplete studies, monographs, dissertations and theses.

When the data was collected, 32 articles appeared in the literature. After applying the filters, this number was reduced to 15 and after reading the titles and abstracts, 8 remained. After reading the full text, 6 articles were selected for the final sample. Finally, the articles found were described in a table and analyzed, specifying title of the study, authors, year, journal of publication, and discussing the strategies or approaches used.

RESULTS AND DISCUSSION

The research conducted *online* in the second half of 2023 (August to October 2023) identified 6 articles that met the inclusion criteria and objectives of this study, which can be seen in Table 01 below:

TABLE 01: Summary of published articles on strategies to reduce dysbiosis symptoms in women.

Title	Author/Year	Objective	Results
Intestinal Dysbiosis and the Use of Prebiotics and Probiotics as Promoters of Human Health.	Quinones <i>et al.</i> , 2018	Mention the effects of probiotics and prebiotics on intestinal dysbiosis.	It has been identified that the use of prebiotics is beneficial for stimulating the growth and activity of certain species of bacteria in the colon, so prebiotics are foods that promote beneficial effects and improve the intestinal microbiota. In addition, probiotics can increase intestinal bacteria, where they are live microorganisms, so by consuming them properly their effects are beneficial in the body and are related to the prevention and treatment of intestinal microbiota disorders.

<p>The relationship between physical exercise and intestinal microbiota.</p>	<p>Cavalcante <i>et al.</i>, 2021</p>	<p>To observe the importance of the role of physical exercise associated with interactions with the intestinal microbiota.</p>	<p>This study shows the relationship between exercise and intestinal microbiota, in which exercise alters the functional capacity of the intestinal microbiota, in addition to reducing risks and controlling gastrointestinal symptoms caused by changes in microorganisms, thus the exercise affects the host's immune pathways and improves energy homeostasis.</p>
<p>Intestinal dysbiosis: correlation with current chronic diseases and nutritional interventions.</p>	<p>Neuhannig <i>et al.</i>, 2019</p>	<p>To verify nutritional strategies in intestinal dysbiosis and their actions in diseases.</p>	<p>This research has shown that the consumption of processed foods alters the intestinal microbiota, and the excess of foods rich in fats and sugars promotes this imbalance in the microbiota. Thus, prebiotics and probiotics influence the stimulation of the selectivity or activity of beneficial bacteria in the intestinal environment, promoting benefits for the individual.</p>
<p>The Importance of Nutrition in Dysbiosis and Intestinal Health.</p>	<p>Tomáz <i>et al.</i>, 2020</p>	<p>Analyze the important role of nutrition in the prevention and treatment of intestinal dysbiosis.</p>	<p>Proper intestinal management in individuals helps prevent diseases and plays an important role in the immune system. This reduces intestinal permeability and dysbiosis, which are consequences of inadequate nutrition. One strategy suggested in the study is to increase dietary fiber intake to improve intestinal health and prevent chronic diseases in these individuals.</p>
<p>The Influence of Nutrition on the Composition of the Intestinal Microbiota and Its Repercussions on Health.</p>	<p>Heringer <i>et al.</i>, 2023</p>	<p>To evaluate the effects of diet on the intestinal microbiota associated with obesity.</p>	<p>In this study, the nutritional relationship linked to the composition of the intestinal microbiota is significantly shown, in which appropriate dietary interventions such as a high-fiber diet cause changes in the types of bacteria present in the intestine that cause fiber fermentation and the production of short-chain fatty acids. Thus, the consumption of fiber in the diet can multiply these beneficial microorganisms, promoting a healthier intestinal microbiota.</p>

<p>Functional Effects of Probiotics with an Emphasis on the Role of Kefir in the Treatment of Intestinal Dysbiosis</p>	<p>Moraes <i>et al.</i>, 2018</p>	<p>To highlight the benefits of probiotics, especially kefir, in the treatment of intestinal dysbiosis, emphasizing their importance in maintaining intestinal health and guidance on their use as an effective nutritional approach.</p>	<p>This review shows that changes in the composition of the microbiota can lead to health problems, and probiotics are one way of restoring the balance of the intestinal microbiota. Kefir is classified as a source of probiotics, with potential health benefits including improving digestion, lowering cholesterol, modulating the immune system and preventing intestinal diseases.</p>
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SOURCE: Authors' data (2023).

An analysis of the literature shows the impact of dietary and lifestyle strategies on the symptoms associated with intestinal dysbiosis and their influence on the intestinal microbiota in women.

Sender *et al.* (2016) consistently reveal that nutritional strategies have a direct influence on the composition and activity of the gut microbiota. Therefore, diet is recognized as a direct modulator of the gastrointestinal microbiota, with the potential to induce changes in physiological responses in the intestinal environment (Tomasello *et al.*, 2016).

Some intervention strategies can be considered to reduce the symptoms related to intestinal dysbiosis. It is therefore advisable to adopt a diet that emphasizes organic foods, free from pesticides and specific additives such as nitrates, nitrites, glutamate and sulphites, and avoiding the consumption of industrialized products and foods that can cause damage to the gastrointestinal system is also crucial, according to (Vieira *et al.*, 2016). The Mediterranean diet approach has also been shown to be beneficial due to the significant increase in the consumption of fruits, vegetables, whole grains and oilseeds, and the predominant use of olive oil as a lipid source, which will modulate the composition of the gastrointestinal microbiota and reduce metabolic endotoxemia (Bailey; Holscher *et al.*, 2018).

In the study by Heringer *et al.* (2023) on diet and intestinal microbiota, it was observed that dietary interventions based on a diet rich in fiber caused changes in the types of bacteria present in the intestine and an increase in fiber fermentation and the production of short-chain fatty acids. In this way, the consumption of fiber in the diet can multiply these microorganisms beneficially, promoting a healthier intestinal microbiota. The study also highlights the need for nutritional guidance that can help women avoid processed foods, high in sugar and saturated fat, which are known to harm the microbiota, and that adopting a balanced and healthy diet, under the supervision of health professionals, can be an effective tool in improving the symptoms associated with intestinal dysbiosis.

In another study, it was pointed out that intestinal dysbiosis is caused by several factors, consisting of an imbalance of the intestinal microbiota, which in fact interferes with a metabolic and inflammatory disorder, related to antibiotics affecting pathogenic and beneficial bacteria, thus, the consumption of foods rich in refined sugars and saturated fats can promote the growth of pathogenic bacteria in the gut, so nutritional strategies that limit these foods help to reduce the growth of these bacteria, contributing to the restoration of microbial balance (Neuhannig *et al.*, 2019).

According to Estaki *et al.* (2016), lifestyle factors should always be considered in relation to intestinal dysbiosis, as they can influence its symptomatology. These factors include stress, use of probiotics and antibiotics, irrational consumption and extension of medication, alcohol intake and diet.

According to Moraes *et al.* (2018), kefir is a fermented beverage produced from grains that contains a stable population of microorganisms with nutraceutical properties and is associated with a variety of health benefits and improved intestinal microbiota and dysbiosis. The composition includes bacteria and yeasts, with the most common genera isolated being *Lactobacillus*, *Leuconostoc*, *Kluyveromyces* and *Pichia* (Plessas *et al.*, 2017). Batista *et al.* (2021) reports that the main bioactive composition present in kefir is kefiran, a symbiotic association of lactic acid and acetic acid bacteria and yeasts. Kefiran is responsible for maintaining the microbiota present in kefir grains and demonstrating anti-inflammatory, antioxidant, immunomodulatory and anti-tumor activities.

Hamida *et al.* (2021) states that Kefir is a food recognized for its probiotic and prebiotic properties, playing a crucial role in the prevention and treatment of intestinal dysbiosis. It also has antimicrobial properties, modulates the immune system's response, has anti-cancer effects and other beneficial health properties. Other studies show that during the fermentation process, functional products are produced that have antioxidant, anti-allergic, anti-tumor, anti-microbial and anti-inflammatory activities (Amorim *et al.*, 2019; Cotârlet *et al.*, 2019).

According to the study by Moraes *et al.* (2018), some of the properties attributed to kefir include modulation of the immune system, improvement in inflammatory bowel disease, suppression of *Helicobacter pylori* infection, reduction of serum glucose levels and reduction of total cholesterol, LDL and non-HDL lipoproteins. Kefir can function as a probiotic in the intestinal microbiota, stimulating the production of insulinotropic peptides and GLP-1, facilitating the ingestion of glucose by the muscle. (2013) kefir is a viable option as a supplement and restorer of intestinal flora due to the presence of bacteria from the human microbiome, which are low in some conditions.

According to Rosa *et al.* (2017) Kefir offers significant health benefits to consumers, restoring the intestinal microbiota, modulating the immune system and helping to reduce the effects of lactose

intolerance and cholesterol. These benefits are linked to the microorganisms present in kefir, which have probiotic functions when consumed regularly.

Quinones *et al.* (2018) investigated the potential of foods as probiotics and prebiotics on the intestinal microbiota. As for probiotics, dairy-derived food products such as yogurt showed positive results due to their ability to increase beneficial intestinal bacteria, with effects on the body related to the prevention and treatment of intestinal microbiota disorders. In addition, the consumption of prebiotics, such as beet and bananas, are important foods due to their ability to promote beneficial effects and improve the intestinal microbiota.

(2020) observed that fiber consumption promotes the formation of metabolites, due to the bacterial fermentation process, such as the formation of short-chain fatty acids (SCFA), which cause numerous benefits to intestinal health, promoting regulation of microbiota homeostasis, renewal of intestinal cells and reduction of intestinal permeability that directly impact on health benefits.

In the study conducted by Suarez *et al.* (2013), the relevance of the use of probiotics, prebiotics and symbiotics was highlighted as being extremely important for the population, as they stimulate the restoration of damaged microbiota, re-establishing balance and reducing the development of associated diseases. In another study, Barros *et al.* (2018) infers that prebiotics play a crucial role in creating an environment conducive to the growth of beneficial bacteria, especially in the colon.

Based on the findings of Denou *et al.* (2016), it is possible to observe through the literature a series of advantages associated with resistance exercise in the context of the gut microbiota. This research indicates that exercise can play a significant role as a modulator of the microbiota, contributing to an increase in the diversity of beneficial bacteria in the body. In addition, evidence points to the positive effects of exercise on improving the microbial profile, the production of Short Chain Fatty Acids and increasing the speed of intestinal transit. These findings highlight the importance of physical exercise as an influential factor in intestinal health, standing out as a promising strategy for promoting the general well-being of the individual.

Low-intensity exercise can have a positive impact on the gastrointestinal tract, speeding up the transit time of feces and consequently reducing the period of exposure of pathogens to the gastrointestinal mucus layer. According to Bevins and Salzman *et al.* (2011), this suggests that exercise has protective effects, reducing the risk of colon cancer, diverticulosis and inflammatory bowel disease.

Regular exercise results in an improvement in the composition and diversity of gut bacteria. According to Campbell *et al.* (2016), exercise has the potential to serve as a therapeutic approach to conditions such as obesity and hypertension, and specifically to the gut microbiota.

Therefore, according to the findings of Cavalcante *et al.* (2021), the study shows that regular physical exercise has a positive impact on the gut microbiota of patients with dysbiosis, improving the diversity and functionality of microorganisms in the gastrointestinal tract. Substantial evidence shows that regular exercise not only alters the composition and functionality of the gut microbiota, but also significantly improves the body's metabolic profile and immune responses. These results highlight the importance of exercise as a key modulator of the gut microbiota, underlining its potential as a promising strategy for improving gut health and promoting the overall well-being of the individual.

CONCLUSIONS

Nutritional strategies and lifestyle play a key role in women's health, especially when they focus on restoring the balance of the intestinal microbiota. By adopting a diet rich in probiotic foods, prebiotics and fiber, along with eliminating processed foods, women not only alleviate symptoms related to intestinal dysbiosis, but also strengthen their immune system, improve the absorption of essential nutrients and promote better digestive health.

In addition, this nutritional approach contributes to hormonal regulation, prevents chronic diseases, improves mental health, supports weight management and reduces menstrual symptoms, positively impacting women's quality of life in various physical and emotional aspects. Ongoing guidance from health professionals is crucial to ensure that women receive the necessary support, enabling them to achieve an optimal state of health and physical and emotional well-being.

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