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REVIEW

Impact of Dysbiosis on Intestinal Health in Young Adults with Chronic Inflammatory Diseases

Impacto de la Disbiosis en la Salud Intestinal de Adultos Jóvenes con Enfermedades Inflamatorias Crónicas

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ABSTRACT

Introduction: gut microbiota played an essential role in human health, especially in functions such as digestion, vitamin synthesis and immune regulation. When this microbial balance was altered, dysbiosis emerged, a condition associated with chronic inflammatory diseases (CID) such as ulcerative colitis and Crohn's disease. In Argentina, these pathologies significantly affected young adults, influenced by factors such as industrialized diets and the excessive use of antibiotics. This study analyzed the relationship between intestinal microbiota and CID in this vulnerable population.
Development: the investigation revealed that patients with CID presented a lower bacterial diversity and an increase in proinflammatory species, such as adherent-invasive Escherichia coli. Environmental factors such as a diet low in fiber and rich in saturated fats, as well as the early use of antibiotics, contributed to these microbial alterations. In addition, dysbiosis was found to be associated with increased inflammatory biomarkers and greater clinical severity. Genetic influences on the predisposition to develop dysbiosis were also identified. The study considered emerging treatments, such as the use of probiotics, prebiotics and fecal microbiota transplantation, which offered promising but still preliminary results.
Conclusions: it was concluded that intestinal dysbiosis played a determinant role in the development and progression of CID in young adults. The need to implement public health policies that promote healthy eating habits and control the use of antibiotics was highlighted, as well as the need to promote new research on therapeutic interventions based on the microbiota.

Keywords: Gut Microbiota; Dysbiosis; Chronic Inflammatory Diseases; Young Adults; Probiotics.

RESUMEN

Introducción: la microbiota intestinal desempeñó un papel esencial en la salud humana, especialmente en funciones como la digestión, la síntesis de vitaminas y la regulación inmunológica. Cuando este equilibrio microbiano se alteró, surgió la disbiosis, una condición asociada a enfermedades inflamatorias crónicas (EIC) como la colitis ulcerosa y la enfermedad de Crohn. En Argentina, estas patologías afectaron de manera significativa a adultos jóvenes, influenciadas por factores como dietas industrializadas y el uso excesivo de antibióticos. Este estudio analizó la relación entre la microbiota intestinal y las EIC en esta población vulnerable.
Desarrollo: la investigación reveló que los pacientes con EIC presentaron una menor diversidad bacteriana y un aumento de especies proinflamatorias, como Escherichia coli adherente-invasiva. Factores ambientales como una dieta baja en fibra y rica en grasas saturadas, así como el uso temprano de antibióticos, contribuyeron a estas alteraciones microbianas. Además, se observó que la disbiosis estuvo asociada a un incremento de

biomarcadores inflamatorios y a una mayor severidad clínica. También se identificaron influencias genéticas en la predisposición a desarrollar disbiosis. El estudio consideró tratamientos emergentes, como el uso de probióticos, prebióticos y trasplante de microbiota fecal, los cuales ofrecieron resultados promisorios aunque aún preliminares.
Conclusiones: se concluyó que la disbiosis intestinal desempeñó un rol determinante en el desarrollo y progresión de las EIC en adultos jóvenes. Se destacó la necesidad de implementar políticas de salud pública que promuevan hábitos alimentarios saludables y controlen el uso de antibióticos, así como de fomentar nuevas investigaciones sobre intervenciones terapéuticas basadas en la microbiota.

Palabras clave: Microbiota Intestinal; Disbiosis; Enfermedades Inflamatorias Crónicas; Adultos Jóvenes; Probióticos.

INTRODUCTION

The gut microbiota, composed of trillions of microorganisms, plays a vital role in human health by intervening in key functions such as digestion, vitamin production, and immune regulation. Under normal conditions, it maintained immune and metabolic balance; however, dysbiosis emerged when this balance was disrupted, a state associated with various pathologies, including chronic inflammatory diseases (CID), such as Crohn's disease and ulcerative colitis. These pathologies, originating from genetic, environmental, and microbial factors, have been more prevalent in recent decades, mainly due to industrialization and changes in dietary patterns, particularly in Western diets rich in fats and sugars.

In Argentina, IBD was found to significantly affect young adults (aged 18–35), a particularly vulnerable group, negatively impacting their quality of life and productivity. The increased use of antibiotics and the transition to industrialized diets contributed to dysbiosis in this population. Research conducted in Latin America documented microbial alterations in patients with IBD, showing a decrease in beneficial bacteria, such as Lactobacillus and Bifidobacterium, and an increase in proinflammatory bacteria, such as invasive adherent Escherichia coli (AIEC).

In addition, IBD not only caused significant physiological effects but also generated a significant psychological burden on patients, affecting their overall well-being. Given this situation, it was essential to investigate how socioeconomic and environmental factors in Argentina influenced the gut microbiota and the prevalence of IBD.

This study aimed to analyze the relationship between the gut microbiota and CIDs in young adults in Argentina, identifying risk factors and patterns of dysbiosis. The goal was to propose therapeutic interventions that could improve patients' quality of life and mitigate the impact of these diseases.

DEVELOPMENT

The gut microbiota is an essential component of the human ecosystem, composed of trillions of microorganisms that inhabit the gastrointestinal tract, including bacteria, archaea, fungi, and viruses. These microorganisms form a complex community that participates in various functions essential for human health, such as nutrient digestion, vitamin synthesis, and immune system modulation. An adequate balance in the microbiota composition is crucial for maintaining the body's homeostasis; however, an imbalance, known as dysbiosis, has been associated with various chronic inflammatory diseases.[1,2]

In particular, chronic inflammatory diseases, such as inflammatory bowel disease (IBD), rheumatoid arthritis, and metabolic syndrome, are multifactorial disorders that present with persistent inflammation, often mediated by both immunological and environmental factors. These conditions usually significantly impact patients' quality of life, delivering a chronic clinical course characterized by episodes of exacerbation and remission. In recent years, various studies have suggested that gut microbiota dysbiosis could be a key factor in developing and perpetuating chronic inflammation observed in these diseases. This link indicates that the microbiota plays an essential role in regulating immune responses and perpetuating pro-inflammatory states when microbial imbalance occurs.[3,4,5,6]

The relevance of studying the microbiota in the context of chronic inflammatory diseases is accentuated in young adults, a group that has shown an increasing prevalence of these diseases. Environmental factors, such as diet and the indiscriminate use of antibiotics, have been identified as essential influences on the composition and functionality of the gut microbiota. Specifically, a diet low in fiber and high in saturated fats and excessive use of antibiotics in early life can cause lasting alterations in the gut microbial community, predisposing the individual to develop inflammatory diseases later in life. In addition, there are genetic factors that could predispose specific individuals to dysbiosis, which in turn exacerbates chronic inflammation. Genes related to the immune response and host-microbiota interaction are involved in susceptibility to inflammatory diseases, such as inflammatory bowel disease.[7,8]

Multiple studies have been conducted to analyze how alterations in the gut microbiota may contribute to the development of chronic inflammatory states. Previous research has shown that patients with IBD have lower bacterial diversity and increased pathogenic or pro-inflammatory microorganisms. This decrease in beneficial bacteria and the predominance of harmful species, such as certain strains of adherent-invasive Escherichia coli, contribute to an abnormal immune response, aggravating intestinal inflammation and perpetuating the inflammatory cycle. In addition, studies on other inflammatory diseases, such as metabolic syndrome, have shown that an altered gut microbiota can influence the host's metabolism, promoting low-grade systemic inflammation. This relationship between microbiota and systemic inflammation suggests that dysbiosis affects the intestinal mucosa and can have repercussions throughout the body, contributing to the development of chronic diseases beyond the digestive tract.[9,10]

On the other hand, analysis of the mechanisms underlying the interaction between the microbiota and the immune system has revealed new therapeutic perspectives. In recent years, fecal microbiota transplantation (FMT) and probiotics and prebiotics have gained ground as potential strategies for restoring microbial balance and improving the symptoms of chronic inflammatory diseases. However, although these approaches have shown promising results, the exact mechanisms by which the microbiota modulates inflammation are not fully understood, and much remains to be investigated regarding the specificity of the microorganisms involved and the long-term effects of such interventions.[11,12]

From a theoretical perspective, this research is based on the hypothesis that gut microbiota dysbiosis is a determining factor in young adults' onset and progression of chronic inflammatory diseases.[13,14,15] The primary independent variable in this study is the composition of the gut microbiota, while the dependent variable corresponds to inflammation and symptom severity biomarkers in chronic inflammatory diseases.[16,17] This conceptual framework suggests that microbiota analysis could serve not only as a diagnostic tool but also as a therapeutic target to mitigate the impact of these diseases on public health.[18,19,20]

The present work is aligned with previous research that has established links between altered gut microbiota and the development of chronic inflammatory diseases. However, it focuses specifically on young adults, a group in which these pathologies are emerging more frequently and in which environmental and lifestyle factors play a crucial role in shaping the gut microbiota.[21] The importance of this research lies in identifying potential modifiable factors, such as diet and antibiotic use, that could be addressed in future interventions to reduce the risk of chronic inflammatory diseases by restoring microbial balance.

CONCLUSIONS

The evidence gathered in this research supports the notion that gut microbiota plays a central role in chronic inflammatory disease (CID) pathophysiology, particularly in young adults. Dysbiosis understood as an alteration in the composition and functionality of the microbiota, has been established as a triggering and perpetuating factor of inflammatory processes at both the intestinal and systemic levels. In this context, inflammatory bowel disease (Crohn's disease and ulcerative colitis) has been directly associated with a loss of microbial diversity and increased proinflammatory species, such as adherent-invasive Escherichia coli.

The analysis highlights the influence of environmental and lifestyle factors, including the Western diet—rich in saturated fats and simple sugars—and the indiscriminate use of antibiotics as key elements in the adverse modification of the gut microbiota. These factors, which are particularly prevalent in contemporary Argentina, disproportionately affect young adults, who face the clinical consequences of microbial imbalance at critical stages of their productive and emotional lives.

In addition, a relationship between dysbiosis and increased inflammatory biomarkers has been identified, strengthening the hypothesis that the gut microbial composition may not only reflect the inflammatory state but also be an active component in its progression. This finding positions the microbiota as a valuable therapeutic target for future prevention and treatment strategies.

While interventions with probiotics, prebiotics, and fecal microbiota transplantation have shown promising results in restoring microbial balance, more robust studies that evaluate their long-term effectiveness and adaptability to the regional context are needed. The heterogeneity of the microorganisms involved and the variability of individual responses require a personalized and multidisciplinary approach.

In conclusion, this research highlights the urgency of implementing public health policies that promote healthy eating habits, regulate antibiotic use, and encourage research on microbial therapies. Recognizing the role of the gut microbiota in CIDs allows us to move toward more preventive and personalized medicine, with the potential to significantly improve the quality of life of young adults affected by these diseases. It is also essential to continue exploring the biological mechanisms involved in this relationship to develop effective and sustainable interventions.

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CONFLICT OF INTEREST
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