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SYSTEMATIC REVIEW

Systematic review: microbiota and chronic inflammatory diseases in young adults

Revisión Sistemática: microbiota y enfermedades inflamatorias crónicas en adultos jóvenes

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ABSTRACT

Introduction: the gut microbiota plays a pivotal role in human health, influencing digestion, vitamin synthesis, and immune regulation. Dysbiosis, or microbiota imbalance, is linked to chronic inflammatory diseases (CIDs), such as Crohn's disease and ulcerative colitis. Factors including genetics, environmental influences, and high-fat Western diets contribute to the prevalence of these conditions, particularly among young adults (18–35 years) in Argentina.
Objective: this study aims to examine the relationship between gut microbiota and CIDs in young adults in Argentina. It seeks to identify risk factors and dysbiosis patterns by: Characterizing microbial composition, identifying dietary and environmental influences, correlating dysbiosis with inflammation and symptom severity, and proposing therapeutic interventions.
Method: this systematic review follows the PRISMA methodology. Population: Young adults with CIDs reported in studies from 2015 to 2024. Variables: Microbiota composition, inflammatory markers, dietary and environmental factors, and probiotic use. Analysis: Data will be extracted and visualized through graphs and tables, with an assessment of the quality of selected studies.
Results: the study aims to identify dysbiosis patterns and their association with environmental factors. It will also evaluate the effectiveness of probiotic interventions in improving symptoms and enhancing the quality of life for CID patients.
Conclusions: this research underscores the significance of gut microbiota as both a diagnostic and therapeutic tool. It aims to propose personalized strategies that could be incorporated into public health policies to mitigate the impact of CIDs.

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

RESUMEN

Introducción: el microbiota intestinal desempeña un papel fundamental en la salud humana, ya que influye en la digestión, la síntesis de vitaminas y la regulación inmunitaria. La disbiosis, o desequilibrio del microbiota, está relacionada con las enfermedades inflamatorias crónicas (EIC), como la enfermedad de Crohn y la colitis ulcerosa. Factores como la genética, las influencias ambientales y las dietas occidentales ricas en grasas contribuyen a la prevalencia de estas afecciones, especialmente entre los adultos jóvenes (18-35 años) de Argentina.
Objetivo: este estudio pretende examinar la relación entre el microbiota intestinal y las IDC en adultos jóvenes de Argentina. Busca identificar factores de riesgo y patrones de disbiosis mediante: La caracterización de la composición microbiana, la identificación de influencias dietéticas y ambientales, la correlación de la disbiosis con la inflamación y la gravedad de los síntomas y la propuesta de intervenciones terapéuticas.

Método: esta revisión sistemática sigue la metodología PRISMA. Población: Adultos jóvenes con CID reportados en estudios de 2015 a 2024. Variables: Composición del microbiota, marcadores inflamatorios, factores dietéticos y ambientales, y uso de probióticos. Análisis: Los datos se extraerán y visualizarán a través de gráficos y tablas, con una evaluación de la calidad de los estudios seleccionados.
Resultados: el estudio pretende identificar patrones de disbiosis y su asociación con factores ambientales. También evaluará la eficacia de las intervenciones probióticas para mejorar los síntomas y la calidad de vida de los pacientes con DIC.
Conclusiones: esta investigación subraya la importancia del microbiota intestinal como herramienta diagnóstica y terapéutica. Su objetivo es proponer estrategias personalizadas que puedan incorporarse a las políticas de salud pública para mitigar el impacto de las IDC.

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

INTRODUCTION

Chronic inflammatory diseases (CIDs), such as Crohn's disease and ulcerative colitis, represent a growing challenge for healthcare systems worldwide. These conditions, characterized by persistent inflammation of the gastrointestinal tract, significantly affect patients' quality of life, especially in young adults, who often go through key stages of personal, professional, and social development. In recent years, there has been growing interest in understanding these diseases' etiological and modulatory factors, with the role of the gut microbiota standing out among them.[1]

The gut microbiota, the collection of microorganisms that inhabit the human digestive tract, plays a fundamental role in regulating the immune system, metabolism, and protection against pathogens. Under normal conditions, this microbial community remains in balance with the host; however, when there is a significant alteration in its composition or function—known as dysbiosis—various inflammatory processes can be triggered or aggravated.[2] Numerous studies have linked dysbiosis to the development and progression of IBD, identifying lower bacterial diversity and a reduction in beneficial species such as Faecalibacterium prausnitzii, as well as an increase in pro-inflammatory microorganisms such as adherent-invasive Escherichia coli.[3,4]

Environmental and lifestyle factors, such as diets high in saturated fat and low in fiber, indiscriminate use of antibiotics, stress, and rapid urbanization, have also been associated with imbalances in the gut microbiota. In Latin America, particularly in Argentina, these conditions are exacerbated by changes in eating habits and unequal access to health services. This could explain the increase in cases among young urban populations.[5,6,7]

What is the relationship between the gut microbiota and the prevalence of chronic inflammatory diseases (CID) in young adults in Argentina, and how do risk factors and dysbiosis patterns influence the clinical evolution of these diseases?

In the study we analyzed the relationship between the gut microbiota and the prevalence of chronic inflammatory diseases (CID) in young adults in Argentina to identify associated risk factors, characteristic patterns of dysbiosis, and their influence on the clinical evolution of these diseases.

METHOD

Study design

This study was a systematic review that analyzed the relationship between the gut microbiota and chronic inflammatory diseases (CID) in young adults. The review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure rigor in identifying, selecting, evaluating, and synthesizing the studies obtained from the search.

Population

The "population" referred to the studies selected for the review, which involved young adults (18-35 years) diagnosed with chronic inflammatory diseases, such as Crohn's disease and ulcerative colitis, and studies on the gut microbiota in this group. Direct population samples were not analyzed, as this was a review study. Instead, previous studies on populations with similar characteristics were analyzed.

Inclusion Criteria

- Study type: clinical trials, observational studies (cohort, case-control), cross-sectional studies, and systematic reviews evaluating the relationship between gut microbiota and CIS in young adults were included.
- Participants: Young adults aged 18-35 years with a diagnosis of inflammatory bowel disease (Crohn's or ulcerative colitis) or other chronic inflammatory diseases.

- Variables studied: Studies that reported on the composition of the microbiota, levels of inflammatory markers, dietary and environmental factors, or the impact of interventions related to the microbiome.
- Language and date: Studies in English and Spanish, published between 2015 and 2024, were included.

Exclusion Criteria

- Studies conducted in pediatric or older adult populations.
- Research that did not include specific analyses of the gut microbiota.
- Studies of low methodological quality (according to the critical assessment of risk of bias).
- Studies published in languages other than Spanish and English.
- Studies published before 2015.

Sample Selection and Size:

The total number of selected articles constituted the sample size and the study population. The sample size was calculated considering a confidence level of 95 % and a margin of error of 5 %, parameters commonly accepted in studies of this type.

Scope of the Study

The study was conducted within the university setting: Faculty of Medicine and Health Sciences of the Inter-American Open University. For this study, studies conducted in a clinical and laboratory setting were selected, with patients from hospitals and specialized care centers for chronic inflammatory diseases, mainly in urban areas with access to adequate health infrastructure.

Description of Variables

- Age.
- Sex.
- Diagnosis of chronic inflammatory diseases (CID).
- Use of probiotics.
- Duration of probiotic treatment.

Data Collection Instruments

Data collection was based on extracting relevant information from the selected articles. A data selection table was implemented, which was transcribed into an Excel spreadsheet and grouped according to variables such as type of study, age, sex, diagnosis, and treatment with probiotics.

Data Analysis Plan

Various graphs were created by creating a database in Excel and transcribing the data acquired from the various scientific articles. The analysis of the data extracted from the selected studies followed these steps:

1. Variables: The primary variables of interest were the microbiota composition, inflammatory markers, and the effects of probiotic treatment.
2. Tables: Tables were created to summarize the characteristics of the selected studies, including the study population, measurement methods, interventions, and results.
3. Graphs: Bar graphs and diagrams were used to visualize comparisons between microbial diversity in patients with and without chronic inflammatory diseases.

Study Biases and Limitations

Selection bias: there was a possibility that some relevant studies were not identified in the literature search, which could have led to bias in the selection of studies.

Publication bias: studies with positive results on using probiotics may have been more likely to be published, affecting the balanced representation of the evidence.

Data Limitations: the quality of the included studies and differences in the methods used to measure the microbiota and inflammatory markers may have limited the external validity of the conclusions obtained.

Resources Required

The following resources were required to conduct this systematic review:

1. Information Collection: This was carried out by the student and their tutor.
2. Computer with Internet Access: For searching and downloading scientific information.
3. Access to Scientific Databases: Institutional access to databases such as PubMed, Scopus, and Web of Science was required to conduct comprehensive literature searches.

4. Software: Such as Word, Excel, and Zotero.
5. Access to the Virtual Library of the UAI (Inter-American Open University).
6. Time for data collection and analysis.

RESULTS

The analysis of the gut microbiota in young adults with chronic inflammatory diseases (CID) has revealed characteristic patterns of dysbiosis. The results indicate lower bacterial diversity than healthy individuals, with significant reductions in Faecalibacterium prausnitzii and increased adherent-invasive Escherichia coli. These alterations reflect a proinflammatory state in the microbiota that exacerbates intestinal inflammation.[5,6]

Diets low in fiber and high in saturated fat were identified as key contributors to dysbiosis. Excessive antibiotic use, especially in early life, is also associated with persistent changes in microbial composition. These environmental factors, combined with genetic predispositions, significantly influence the development and progression of IBD.[7,8]

The impact of dysbiosis was also evident in inflammatory biomarkers. Patients with severe microbiota imbalances had elevated levels of C-reactive protein (CRP) and fecal calprotectin and more frequent and severe episodes of symptom exacerbation. These findings underscore the importance of the microbiota in regulating chronic inflammation.[9,10]

Probiotic treatments showed promising results in terms of therapeutic interventions. Species such as Bifidobacterium longum and Lactobacillus plantarum contributed to improving patients' quality of life and reducing inflammatory markers. In addition, prolonged use of probiotics increased microbial diversity, especially in cases of Crohn's disease.[11,12,13,14] On the other hand, fecal microbiota transplantation was evaluated as a therapeutic option in severe cases, although results were mixed and required further investigation.

Finally, these findings support the need to design personalized strategies that include dietary modifications and the use of probiotics and prebiotics. Such interventions could be tailored to the Argentine population's specific microbiological and nutritional characteristics.[15,16,17] In addition, fecal microbiota transplantation is proposed as an alternative in more complex clinical situations. These proposals would contribute to more effective management of CD and the development of public health policies that address this issue in the region.

Número de Abstracts Leídos	Resultados Identificados
10-20 abstracts	Identificación de patrones generales de disbiosis en pacientes con EIC, incluyendo menor diversidad bacteriana y aumento de bacterias proinflamatorias.
21-40 abstracts	Asociación entre dietas occidentales (bajas en fibra, altas en grasas) y uso de antibióticos con alteraciones en la microbiota.
41-60 abstracts	Relación directa entre disbiosis y marcadores inflamatorios elevados, como PCR y calprotectina fecal, y su impacto en la gravedad de los síntomas.
61-80 abstracts	Eficacia de probióticos (como **Bifidobacterium longum**) en la reducción de inflamación y mejora de calidad de vida en pacientes con EIC.
81-100 abstracts	Propuestas de intervenciones avanzadas como trasplante de microbiota fecal y su potencial en casos graves (resultados mixtos).

Figure 1. Number and characteristics of results obtained in the search

DISCUSSION

The findings of this study support the hypothesis that intestinal dysbiosis plays a central role in the pathophysiology of chronic inflammatory diseases (CID) in young adults. The results highlight reduced bacterial diversity, specifically a reduction in Faecalibacterium prausnitzii and increased proinflammatory bacteria such as adherent-invasive Escherichia coli. These microbial changes are consistent with previous research linking dysbiosis to exacerbated inflammatory processes and immune alterations.[18]

In addition, the association of environmental factors such as low-fiber and high-saturated fat diets and excessive antibiotic use with lasting alterations in the microbiota was confirmed. These results are consistent with regional studies that point to Western diets and unregulated medical practices as key factors in the increase of these diseases in Latin America, particularly in Argentina.[19]

The correlation between dysbiosis and elevated levels of inflammatory biomarkers, such as C-reactive protein (CRP) and fecal calprotectin, reinforces the idea that microbial composition may directly influence the severity of clinical symptoms. This link suggests microbiota could be used as a diagnostic biomarker and

therapeutic target.[14,15]

On the other hand, therapeutic interventions showed promising results. Specific probiotics, such as Bifidobacterium longum and Lactobacillus plantarum, significantly improved the patient's quality of life and decreased inflammatory markers. However, fecal microbiota transplantation, although showing potential in severe cases, presented variable results that require further research to establish its long-term safety and efficacy.[20,21]

This work was based on a high-methodological quality systematic review following the PRISMA guidelines, which guarantee rigor in the selection and analysis of studies. In addition, it addresses a relevant public health issue in Argentina, considering specific factors of the regional context.

Among the limitations is the potential for publication bias, given that studies with positive results are more likely to be published. Also, differences in microbiota analysis methods between the selected studies may affect the comparability of the results.

The results of this research underscore the need to implement personalized therapeutic strategies, including promoting fiber-rich diets and using probiotics to restore microbial balance. In addition, regulation of antibiotic use and consideration of advanced interventions such as microbiota transplantation in specific cases are recommended.

Controlled clinical trials are needed to evaluate the long-term efficacy of probiotic interventions and fecal microbiota transplantation in specific populations. Exploring the relationship between microbiota and other organ systems affected by chronic inflammation would also be relevant.

CONCLUSIONS

Intestinal dysbiosis is confirmed to play a central role in the development and progression of IBDs, such as Crohn's disease and ulcerative colitis. Changes in microbial composition, with a decrease in beneficial bacteria and an increase in pro-inflammatory microorganisms, exacerbate systemic and local inflammation.

Dietary and environmental factors and the indiscriminate use of antibiotics in the young population are key determinants in the alteration of the gut microbiota. The growing prevalence of Western diets low in fiber and high in saturated fats has contributed to the increase in dysbiosis and, consequently, IBD.

Young adults in Argentina are particularly vulnerable due to the interaction between genetic, environmental, and lifestyle factors. This significantly impacts their quality of life and productivity, highlighting the need for specific intervention strategies for this group.

The studies reviewed support the therapeutic potential of microbiota modulation through probiotics, prebiotics, and fecal microbiota transplants. Although promising, these strategies require further research to ensure their long-term efficacy and applicability in the local context. Integrating knowledge about the microbiota, inflammation, and socioeconomic factors into health policy design can improve the prevention and treatment of IBD. This also includes the development of educational and management strategies that promote a healthy lifestyle and reduce the incidence of dysbiosis.

It is suggested that longitudinal studies be implemented in Argentina to more specifically evaluate the relationship between microbiota and CKD, as well as clinical trials to test the effectiveness of microbiota-based interventions adapted to the regional context.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTION

Conceptualization: Emanuel Zenon Aviza Joaquín, Daniel Nestor Chiacchiara.
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