CLINICAL SIGNIFICANCE OF GUT MICROBIOTA ALTERATIONS IN CHILDREN WITH AUTISM SPECTRUM DISORDER AND THEIR ROLE IN PEDIATRIC REHABILITATION

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ANNOTATION:

Autism Spectrum Disorder (ASD) is one of the most common neurodevelopmental disorders in childhood and is characterized by persistent deficits in social communication, restricted interests, and repetitive behavioral patterns. During the past decade, increasing evidence has highlighted the importance of the gut–brain axis in the pathogenesis of ASD. Gastrointestinal symptoms are considerably more prevalent among children with ASD than among neurotypical peers, suggesting that intestinal dysbiosis may contribute to disease progression. This review aims to summarize current evidence regarding gut microbiota alterations in children with ASD and discuss their clinical significance and potential role in pediatric rehabilitation. Literature published in major scientific databases was analyzed with particular emphasis on microbial diversity, inflammatory mechanisms, intestinal permeability, microbial metabolites, and microbiota-targeted therapeutic interventions.

Current evidence indicates that alterations in intestinal microbiota composition may influence immune regulation, neurotransmitter synthesis, and neuroinflammatory processes. Dietary interventions, probiotics, prebiotics, and other microbiota-modulating strategies may improve gastrointestinal symptoms and potentially enhance rehabilitation outcomes. However, further large-scale randomized controlled studies are required to establish standardized clinical recommendations.

Introduction

Autism Spectrum Disorder (ASD) is a heterogeneous neurodevelopmental disorder affecting millions of children worldwide. The prevalence of ASD has increased steadily over recent decades, making it an important public health concern. Although genetic susceptibility plays a fundamental role in ASD development, environmental, immunological, metabolic, and microbial factors have also been recognized as significant contributors. Recent advances in microbiome research have revealed a complex bidirectional communication network known as the gut–brain axis. This system integrates neural, endocrine, metabolic, and immune pathways that enable continuous interaction between the gastrointestinal tract and the central nervous system.

Children with ASD frequently present with constipation, diarrhea, abdominal pain, bloating, food selectivity, and other gastrointestinal disorders. These symptoms often correlate with behavioral severity and reduced quality of life. Emerging studies suggest that alterations in gut microbial diversity may influence neurological function through immune activation, production of microbial metabolites, modulation of neurotransmitters, and increased intestinal permeability. Consequently, gut microbiota has become a promising therapeutic target in pediatric rehabilitation, offering new opportunities for multidisciplinary management of children with ASD.

Aim of the Study

To analyze current scientific evidence regarding alterations of gut microbiota in children with Autism Spectrum Disorder and evaluate their clinical significance and potential role in pediatric rehabilitation.

Materials and Methods

This study was conducted as a narrative review of current scientific literature. Relevant publications were identified through electronic searches of PubMed, Scopus, Web of Science, and Google Scholar. Articles published between 2020 and 2026 focusing on ASD, gut microbiota, pediatric rehabilitation, probiotics, intestinal dysbiosis, and gut–brain axis were considered.

Original clinical studies, systematic reviews, and meta-analyses published in English were included. Conference abstracts, duplicate publications, animal-only studies, and articles without full-text availability were excluded. The selected publications were analyzed according to study design, participant characteristics, microbiota composition, gastrointestinal manifestations, neurological outcomes, rehabilitation interventions, and principal findings.

Results

Analysis of current literature demonstrated that children with ASD consistently exhibit significant alterations in gut microbial composition compared with healthy controls. Reduced abundance of beneficial microorganisms including *Bifidobacterium*, *Lactobacillus*, and *Faecalibacterium* has been reported in numerous studies, whereas increased levels of

Clostridium, *Desulfovibrio*, and several opportunistic bacterial species have frequently been observed. These microbial alterations are associated with chronic gastrointestinal symptoms affecting approximately 40–70% of children with ASD. Constipation, abdominal pain, diarrhea, bloating, and feeding difficulties represent the most commonly reported clinical manifestations. Several investigations have demonstrated positive associations between gastrointestinal symptom severity and behavioral impairment, including reduced social interaction, repetitive behaviors, emotional dysregulation, and communication deficits.

Furthermore, studies evaluating microbiota-directed interventions suggest that probiotic supplementation, dietary modification, and prebiotic administration may improve gastrointestinal health and, in selected patients, contribute to modest improvements in behavioral outcomes and overall quality of life.

Discussion

The findings support the hypothesis that intestinal dysbiosis contributes to ASD pathophysiology through multiple biological mechanisms. Gut microorganisms regulate immune responses, synthesize short-chain fatty acids, influence tryptophan metabolism, and participate in serotonin and gamma-aminobutyric acid (GABA) production. Disruption of microbial homeostasis may increase intestinal permeability, facilitating systemic exposure to inflammatory mediators and bacterial metabolites capable of influencing neurodevelopment. Chronic immune activation and neuroinflammation have therefore been proposed as important mechanisms linking intestinal dysbiosis with ASD. From a rehabilitation perspective, modulation of gut microbiota represents a promising complementary therapeutic strategy. Nutritional counseling, individualized dietary management, probiotics, prebiotics, and multidisciplinary rehabilitation programs may collectively improve gastrointestinal function and support neurological recovery.

Nevertheless, considerable heterogeneity exists among published studies regarding patient selection, microbial analysis techniques, intervention protocols, and outcome measures. Consequently, additional multicenter randomized controlled trials are necessary before microbiota-based therapies can be routinely recommended in pediatric clinical practice.

Conclusion

Current scientific evidence indicates that alterations in gut microbiota are closely associated with gastrointestinal dysfunction and may contribute to neurological manifestations in children with Autism Spectrum Disorder. Gut microbiota represents a promising diagnostic biomarker and a potential therapeutic target in pediatric rehabilitation. Future research should focus on standardized microbiome analysis, personalized microbiota-based interventions, and long-term clinical outcomes to optimize rehabilitation strategies and improve the quality of life of children with ASD.

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