

Probiotics: A Promising Solution for Irritable Bowel Syndrome (Ibs)

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Article History	Abstract
Received: 28 Sept 2023 Revised: 21 Oct 2023 Accepted: 02 Nov 2023	<i>Irritable Bowel Syndrome (IBS) is a distressing functional gastrointestinal disorder that is increasingly recognized as a condition involving both the gut and the brain. In today's healthcare landscape, probiotics have become a common component of many people's wellness routines, independent of prescribed medications. There is substantial evidence supporting the potential of probiotics to provide therapeutic benefits for individuals dealing with irritable bowel syndrome. Recent studies emphasize the pivotal role of the microbial factor in the pathophysiology of IBS, as some research has identified significant alterations in the gut microbiome of individuals with IBS. Consequently, the impact of probiotics on IBS patients is under intense investigation in the current era of probiotic research. The precise mechanisms of action are not yet fully understood, but presently, probiotic products tailored for IBS relief are readily available in the market and have shown the potential to alleviate symptoms effectively. Evidence suggested that strains of <i>Lactobacillus</i> species, strains of <i>Pediococcus</i> species and <i>Bifidobacterium</i> species may show effective results in some patients of IBS. The aim of this study is to uncover potential causative factors contributing to IBS and to explore the use of probiotics as an efficacious treatment approach for IBS.</i>
CC License CC-BY-NC-SA 4.0	Keywords: Probiotics, Irritable Bowel Syndrome (IBS), <i>Lactobacillus</i> species

1. Introduction

The word probiotics defined itself as non-pathogenic beneficial microbes by the name which can be used for the betterment of life. They exhibit good health effects particularly on digestive system through different mode of actions. This can be consumed as food and dietary supplements that are regulated by Food and Drug Administration (FDA) [Sen M., 2019]. Irritable Bowel Syndrome has described itself as a collection of bothersome symptoms in the gut including chronic abdominal pain, bloating, cramps, constipation or diarrhoea or both; which can result from various etiological factors like stress, depression, smoking and alcohol consumption, infection malabsorption, antibiotic usage and gut microbiome changes. There were several criteria for diagnosis of IBS. Among them according to the ROME III criterion there are some symptomatic subtypes of IBS, they are- (a) IBS-C (Constipation), (b) IBS-D (Diarrhoea), (c) IBS-M (Mixed), (d) IBS-U (Unsubtyped) [Lacy B.E. et al, 2017]. malabsorption, antibiotic usage and gut microbiome changes. There were several criteria for diagnosis of IBS. Among them according to the ROME III criterion there are some symptomatic subtypes of IBS, they are- (a) IBS-C (Constipation), (b) IBS-D (Diarrhoea), (c) IBS-M (Mixed), (d) IBS-U (Unsubtyped) [Lacy B.E. et al, 2017]. Table 1: Classification of IBS according to ROME criteria III.

[Lacy B. E. et al., 2017] History says being the gut microbiome developer probiotics have the most beneficial effects on symptoms of IBS from ancient time. Literature says many researchers have shown efficient effects of various probiotic strains on different subtype of IBS. Among all strains of *Lactobacillus* sp., *Pediococcus* sp. and *Bifidobacterium* sp. have widely studied by the time. This study aims at the effects of these three species on control of IBS. Some findings from the provided references are summarized below in regard of use of various probiotic strains in reduction of different

symptoms of IBS. A study shows that numbers of *Bifidobacterium species* can be increased through application of multistrain probiotics in accordance with low FODMAP (Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols) diet. This species provides immunomodulatory effects preventing clinical symptoms of IBS.[Thomas A. *et al.*, 2022]. Efficient reduction of bloating and abdominal symptoms can be obtained by the application of specific combinations of different strains consisting mainly of Lactic Acid Bacteria (LAB) and *Bifidobacterium species* [Horvat I. B. *et al.*, 2021]. According to the authors, probiotics normally live in symbiotic relationships in the human guard flora which can modulate gut microbial maintaining the dysbiosis. The mechanism supports the theory of gastrointestinal condition treatment with the admission of probiotics [Bousdouni P. *et al.*, 2022]. Studies have been developed on the effect of property both in vivo and in vitro on various systems isolated lamina propria, monocyte drained dendritic cells, bone marrow derived dendritic cells, whole blood etc.[Simon E. *et al.*, 2021]. Kumar L. S. *et al.*, (2022) have stated that a strain of *Bacillus coagulans* have efficacy in alleviating IBS symptoms such as cramps, bloating, nausea, vomiting, constipation, diarrhoea. With production of essential nutrients in colonic mucosa probiotics can also eliminate toxins, prevent microbial translocation, improve intestinal immunity by assisting in recovery of disturbed gut health.

Table 1: Classification of IBS according to ROME criteria III

improvement in adhesion to intestinal mucosa, inhibition and exclusion of pathogenic adhesion, antimicrobial substance production, modulation of metabolic responses including immune and neural systems [Chin K. *et al.*, 2022]. Anna Gora revealed that the tell-tale sign of IBS is dysbiosis. The term defines an imbalanced gut microbiome. Sen M. (2019) stated that being a live organism there is also risk of probiotics that can cause infection which can be treated with antibiotics. It can happen in people with some underlying health conditions. Research says the most common probiotic is *Lactobacillus species* (abundant in fermented foods and yogurt) that can ease the IBS and constipation symptoms. Genus bifidobacterium is a group of probiotics present in many milk products. Species of this genus (found in kefir, sour cream, fermented cheese, breast milk, kombucha, miso, sauerkraut etc.) mainly prevent growth of bad bacteria in the gut that may contribute symptoms of IBS [Mahammad J., 2022]. Authors considered that *Pediococcus species* are commonly found in fermented milk or cheese products, fermented cereal products and fermented flesh foods like marinated meat or fish. They have shown the property of improvement in gut specific anxiety found in IBS patients when applied in a combination with *Lactobacillus species* [Holland R. *et al.*, 2011].

Research Design

Studies suggest that there are many methods of application of probiotics and measurement of probiotic effects on IBS symptoms. Among them, an abundantly found procedure is to introduce the probiotic mainly in the form of capsule or drug and other forms of dietary supplements in conjunction with a low FODMAP diet routine [(Horvat I. B. *et al.*, 2021), (Kazmierczak-Siedlecka K. *et al.*, 2020), (Galica A. N. *et al.*, 2022), (Thomas A. *et al.*, 2022)]

Method of the study should commonly be a random clinical trial and the duration of therapy could depend on the researcher (ranging from at least 7 days to 30 days) [(Galica A. N. *et al.*, 2022), (Bousdouni P. *et al.*, 2022)]

The analytical part was normally done through serum and fecal sample analysis. Widely renowned parameter, known as Bristol stool scale is usually applicable on fecal analysis of IBS patients [(Portincasa P. *et al.*, 2022), (Yang B. *et al.*, 2021)]

Table 2: Bristol Stool Form Scale (BSFS)

Types	Characteristics Of Stool
1	Separate hard lumps like nuts
2	Sausage shaped but lumpy
3	Sausage shaped with cracks
4	Sausage or snake shaped but smooth and soft
5	Soft bolbs with cut edges
6	Mushy form in fluffy pieces with ragged edges
7	Watery with no solid

[Lacy B.E.*et al.*, 2017]

Here in the study we have reviewed the effectiveness of three genres of probiotic groups. The discussion about these three types is demonstrated below accordingly.

Lactobacillus

species Different species of this genus have shown better relief in the IBS symptoms i.e. reduction of flatulence, abdominal pain and improvement of stool frequency and stool consistency etc. [Herndon C. C. *et al.*, 2020].

Table 3: Probiotic effects of *Lactobacillus* species

Different Species	Target Group	Under Effect Conditions
<i>L. plantarum</i>	IBS	Reduce flatulence and abdominal pain and showed therapeutic benefit
<i>L. plantarum</i>	IBS-C, IBS-D, IBS-U	Reduce abdominal pain and improve overall symptoms
<i>L. rhamnosus</i>	IBS	Reduce incidence of abdominal distension
<i>L. rhamnosus</i>	IBS in children	Reduce pain frequency
<i>L. reuteri</i>	IBS in children	Reduce severity and frequency of abdominal pain

[Herndon C. C. *et al.*, 2020]

Bifidobacterium species

Various species from the genus have proven the remarkable result in diminishing the symptoms of IBS such as improvement of blotting, constipation, distension, discomfort and depression also [Herndon C.C. *et al.*, 2020]

Table 4: Probiotic effects of *Bifidibacterium* species

Different Species	Target Group	Under Effect Conditions
<i>B. lactis</i>	IBS	Improve global symptoms of IBS
<i>B. bifidum</i>	IBS	Improve abdominal pain and discomfort with bloating
<i>B. infantis</i>	IBS-C	Decrease bloating score
<i>B. lactis</i>	IBS-C	Reduce maximal distension and colonic transit time, improve overall symptom severity

[Herndon C. C. *et al.*, 2020]

Pediococcus Species

Most of the studies have shown the application of this species in combination with other genus. Though we have identified the activity field of this particular from one article which states its efficacy as probiotic defining the fields that are alteration in intestinal microbiota enhancement of beneficial microbial taxa, up regulation of expression level of immune related genes, production of bacteriocins, inhibition of pathogenic proliferation [Shan C. *et al.*, 2021]

Table 5: Probiotic effects of *Pediococcus* species

Different Species	Target Group	Under Effect Condition
<i>P. Acidilactici</i>	Ibs	Improve Abdominal Distension And Quality Of Life
<i>P. Damnosus</i>	Ibs	Produce Immunomodulatory Effects
<i>P. Parvulus</i>	Ibs	Produce Bifidogenic Effect
<i>P. Pentosaceus</i>	Ibs-C	Relieves Constipation

[(Shan C. *et al.*, 2021), (Bhagat D. *et al.*, 2020), (Lindstrom C. *et al.*, 2013), (Huang J. *et al.*, 2020), (Todorov SD. *Et al.*, 2023)]

Combination Form

The majority of the articles have shown the application of probiotic strains in combination forms which covered a group of IBS symptoms such as- (a) Combination of *Lactobacillus* and *Pediococcus* species can reduce frequency of diarrhea, inflammation, anxiety and improve quality of life. (b) Strains of *Lactobacillus* and *Bifidobacterium* in combination with *Streptococcus* can manifest overall symptoms of IBS because of metabolism modulation. These effects can be explained through such

mechanisms like facilitation of intestinal flow, reabsorption of electrolytes, reduction of diarrhoea etc. [(Horvat I.B. *et al.*, 2021), (Galica A.N. *et al.*, 2022), (Bousdouni P. *et al.*, 2022).

2. Conclusion

From the above discussion we can conclude that species of *Lactobacillus*, *Bifidobacterium* and *Pediococcus* have a wide range of efficacy as probiotic which can be vigorously used to treat the symptoms of IBS. Although there is a huge amount of research done upon this field, we suggest more studies should be done with single strain and single genus application in this field.

Authors Contribution

Munnema Shabnom conceptualized and designed the content and wrote the paper as well. Ayan Datta has contributed to the data collection and literature screening process. Dr Rupali Dhara Mitra edited the total paper. All authors contributed to the article and approved the submitted version.

Conflict Of Interest

The authors declared that the research was conducted in absence of commercial and financial interest that could be reckoned as potential conflict of interest.

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