



Review Article

Recommendation and limitation of probiotics supplements

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ABSTRACT

Probiotics are beneficial microorganisms often recommended for various patients or persons suffering from gastrointestinal health issues. These microorganisms are generally helpful bacteria and yeast present naturally in fermented foods. There is a growing demand for probiotic supplements manufactured by pharmaceuticals and nutraceuticals companies globally due to the beneficial effects of natural probiotic intolerance. This study is a mini-review narrated the helpful and harmful effects among various sections of patients usually concerned with supplements. Probiotics are highly recommended for patients with ulcerative colitis, Crohn's disease, weight management, urinary tract infections, lactose and gluten intolerance, irritable bowel syndrome, and many more. Bifidobacterium, Lactobacillus are the probiotics or 'good bacteria', and *Saccharomyces boulardii* is a type of yeast that has also become a popular probiotic for the recommendation in diarrhea cum gastrointestinal issues. The study has emphasized the mode of actions and beneficial effects of supplements and categorically discussed the side effects, special precautions, and warnings for adults and children. More importantly, whether recommendations or limitations should be considered by experienced medical professionals treating such patients. More awareness and research are required in this probiotics field to understand the proper guidance and limits.

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1. Introduction

Probiotics supplements have become more popular globally among different populations to achieve better nutrition cum health. In the human body, some microorganisms always play active roles in the digestion and absorption of food to maintain gastrointestinal health. Generally, probiotics are naturally originated from fermented foods and cultured milk. Many traditional foods are already popular in western countries that are often consumed as naturally-originated probiotics such as greek yogurt, kimchi, sauerkraut.^{1,2}

In recent days, pharmaceuticals and nutraceuticals companies manufacture different probiotic supplements for digestive health issues based on market demand. Probiotic supplements do work as mediators in health and nutrition in the human host. Various studies show the relationship between microbiota and pathophysiological

disease processes in the host's digestive, nervous, urinary, and genital systems.³

2. Research Methods

A short narrative review study mainly highlighted various probiotics available both in natural and supplements in the global as well Indian market. Rather than revenue and economic analysis, the study is more concerned about the proper uses in clinical nutrition for the patients suffering from various gastrointestinal health issues (gut health). Some related keywords and phrases are searched in multiple open-access databases and review in a simple narrative review manner.⁴ The study also discusses the many important health issues where probiotics can be recommended. In addition to that, it also emphasized elaborate side effects, special contraindications, and warnings. More importantly, physicians or dietitians, and other health care experts can only advise the right one to

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particular patients.⁵

3. Discussions

3.1. Probiotic supplement market

Functional foods and beverages enrich some probiotics that have occupied a good market share in the last few decades. Many natural probiotics contain active physiological ingredients that help with various metabolic, physiological, and nutritional benefits. There is an increasing demand for non-dairy probiotic supplements or low lactose and cholesterol content for a long time. A recent report showed that the number of reviews cum analytical studies available for probiotics increased by 164% and 111% subsequently in 2019 and 2020 among inflammation, diabetes, and muscular health consumers.⁶

Global human microbiota and other similar supplements market was observed the value at tentatively 722 US million in 2017 and is expected to reach approximately 1,350 million by the year 2024. The CAGR would be tentatively 9.42% from 2018 to 2024. The key players in the global probiotic supplements market are Danone, Nestle, Activia, Yakult, Actimel, and Yakult. Bright Dairy, Lifeway Foods Inc., BioGaia, and CHR Hansen are other prominent and promising companies in the same fields.^{7–9}

3.2. Probiotics recommendation in the following diseases

1. *Colic and ulcerative colitis*: Probiotic bacteria are usually present inside the gastrointestinal system in a host body as a symbiotic relationship. They, along with their collective genomes, are called the gut microbiome, maintain intestinal microbial balance. Probiotics natural and supplements both can enhance gut function and progress local immunity.^{10,11}
2. *Constipation*: Prolonged fecal stasis in the colon of patients suffering from constipation can be improved by gut microbiota, increasing fecal motility and enzymatic actions. However, despite significant effects, there is no firm evidence of activity by probiotic supplements towards constipation.^{12,13} The best-recommended treatment is a soft cum bland diet with adequate fiber and fluid intake.
3. *Crohn's disease*: In this disease, immunosuppressors are recommended to reduce the host response, and antibiotics are used to diminish the action of the bacterial flora. Some genetic and microbiological studies show that the intestinal microbiota is one of the significant factors chronic suffering of the Crohn's inflammatory process in genetically susceptible persons. Commercial probiotics are highly recommended in addition to other natural functional foods for CD.^{14,15}

4. *Diarrhea*: people are always advised to consume probiotic foods along with plenty of electrolytes during diarrhea. Diarrhea is the second-largest cause of death among children who are under five years of age. In all these cases, probiotics that are non-pathogenic live microorganisms can prevent and survive in the stomach and small bowel. Hence, probiotics are highly preventive and curative in different diarrhea.^{16,17}

5. *Dyslipidemia*: Intestinal microbiota modulate the mechanisms that are the risk factors for various cardiovascular diseases, even dyslipidemia. In a study, probiotics supplements significantly reduced low-density lipoprotein, total cholesterol, triglycerides (TGL), and enhanced high-density lipoprotein. Some benefits were also observed on glycemic control, anthropometric variables, oxidative stress, immune system, and inflammation.¹⁸

6. *Irritable bowel syndrome*: Irritable bowel syndrome or IBS is a prevalent gastrointestinal condition that affects millions of people worldwide. New hypotheses about the pathogenesis of IBS have emerged in recent years. Changes in gut motility, small-bowel bacterial overgrowth, microscopic inflammation, visceral hypersensitivity, and changes in the brain-gut axis are all examples of these notions.¹⁹

7. *Lactose intolerance*: Probiotic bacteria found in fermented and unfermented milk products have been shown to help with the clinical symptoms of lactose intolerance (LI). Probiotics are live bacteria or yeast that help to balance the gut flora. Lactose intolerance symptoms and HBT could be reduced safely and efficiently by probiotic yogurt enriched with *L. acidophilus* and *Bifidobacterium* sp.^{20,21}

8. *Gluten intolerance*: In celiac disease patients, wheat gliadin causes severe intestinal symptoms and mucosal destruction in the small intestine. At this time, the only effective treatment for the disease is a strict gluten-free diet for the rest of one's life. *B. lactis* bacteria can directly reverse the adverse effects of coeliac-toxic gliadin, indicating that more research into its potential as a novel dietary supplement is warranted.^{22,23}

3.3. Mechanism of action of probiotics

In the below Table 2. mode of actions have been discussed for various available probiotics that are usually consumed by common and typical patients

3.4. Contraindications/Adverse effects^{29,30}

According to a 2002 report published by World Health Organization and the Food and Agriculture Organization, probiotics are not always safe. They have proper recommendations from the physicians or dietitians. Systemic infections, harmful metabolic activities, excessive

Table 1: Various types of probiotics.^{2–8}

<i>Bifidobacterium</i>	It is found in some milk products helpful in irritable bowel syndrome (IBS).
<i>Lactobacillus</i>	It is usually found in yogurt and other fermented foods help in diarrhea and lactose intolerance.
<i>Saccharomyces boulardii</i>	It is a yeast found in functional foods beneficial for diarrhea and other G.I issues.

Table 2: Mechanism of action of various probiotics

Nutritional impact	Some types of microbiota can play a significant role in producing vitamins such as vitamin k, B complex, niacin, B1, B6. They also have short-chain fatty acids by gut microbiota. ²⁴
Pathogen resistance	Probiotics can prevent opportunities infections by secretion of SCFAs, lactic acid. Reactive oxygen species (ROS) in probiotics can inhibit the growth of pathogenic organisms. ²⁵
Immunity actions	Probiotics are capable of acting as an anti-inflammatory by activating IL-12, IL-10 natural killer cells immunity. ²⁶
Drug and Xenobiotic metabolism	Natural probiotics and supplements can function on xenobiotics that er potentially harmful chemical substances like pesticides, cosmetics. Further, they can metabolize medicine like paracetamol by the inhibition of hepatic sulfotransferases. ²⁷
Bile acid metabolism	<i>Bacteroides intestinalis</i> as a potential gut microbiota can dehydrate and deconjugate primary bile acids and convert them into secondary bile acids to prevent vegetative growth of <i>C. difficile</i> . ²⁸

Table 3: Contraindications / adverse effects for vulnerable populations^{30–32}

Factors / vulnerable populations	Details about precautions and warnings
Children use	Children are likely to be safe with probiotics containing bifidobacteria or Lactobacillus. Administration for up to 12 months, Bifidobacteria probiotics appear to be safe in children. When administered for up to 12 weeks, Lactobacillus probiotics appear to be safe in children. When taken in youngsters, probiotics containing Saccharomyces boulardii may be safe.
Digestive system problems	Blood infections have been recorded in a small number of persons who were taking probiotics containing lactobacillus or bifidobacterium probiotics and had digestive system problems such as short bowel syndrome, ulcerative colitis, or intestinal obstruction (after abdominal surgery).
Yeast/fungus allergy	Probiotic products containing Saccharomyces boulardii can cause adverse reactions in those with yeast allergies; hence they should be avoided if feasible.
Poor immune system	These are helpful for poor immunity people who are suffering from T.B, HIV/AIDS; however, patients must talk to physicians for better suggestions
Non-functional heart valves	Lactobacillus-based probiotics can cause an infection in the inner lining of the heart chambers and heart valve. Although this is exceedingly unusual, patients with compromised heart valves may be more susceptible to disease. Before dental or surgical operations, people with compromised heart valves should cease taking probiotics.
Central lines issue	People with central lines who take probiotics containing lactobacillus or Saccharomyces boulardii have been documented to get blood infections. In many cases, air, surfaces, or hands that had come into contact with the probiotics were triggered by air, characters, or hands.
Pregnancy and breastfeeding:	It should be administered by mouth; probiotics containing particular lactobacillus or bifidobacteria species should be safe subject to healthcare advice.

immunological stimulation in sensitive people, gene transfer, and gastrointestinal side effects are all examples of adverse consequences or side effects (Table 3). To accurately identify the occurrence and severity of probiotic-related side effects, more study is needed. Gas or bloating are the most common side effects, which are usually moderate.

4. Conclusions

The probiotics supplements market is growing due to the demand from various gastric patients. Probiotics are recommended for gastrointestinal health issues and other critical issues like poor immunity, weight management, proper nutrition. The supplements are highly effective many times in the infections of multiple systems and better actions of some medications. Probiotics can be recommended for general treatment to medical nutrition therapy by

experienced medical professionals. Altogether, proper recommendations and limitations must be scientifically understood at the experts' and patients' levels. Hence, more research and awareness are required to acquire more knowledge on probiotics.

5. Source of funding

None.

6. Conflict of interest

None.

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