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ORIGINAL RESEARCH

Efficacy of Probiotics in the Prevention of Gastrointestinal Infections among Children Aged 1–5 Years in a Tertiary Care Setting In Karnataka

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ABSTRACT

Background: Gastrointestinal (GI) infections are a major cause of morbidity and hospitalization in children, particularly in the age group of 1 to 5 years. With increasing concerns over antibiotic resistance and recurrent diarrheal episodes, probiotics have emerged as a promising preventive strategy. This study aimed to evaluate the role of probiotic supplementation in reducing the incidence of gastrointestinal infections among children attending a tertiary care center in Karnataka. **Methods:** A prospective observational study was conducted over a period of two years, from February 2022 to February 2024, involving 1000 children aged 1 to 5 years. Participants were divided into two groups: those receiving regular probiotic supplementation and those not receiving probiotics. Clinical data including frequency, duration, and severity of GI infections were recorded. Data were analyzed to compare the incidence of GI infections between the two groups. **Result:** The study observed a significant reduction in the number of gastrointestinal infection episodes among children who received probiotics regularly as compared to those who did not. Additionally, the probiotic group showed reduced severity and shorter duration of symptoms. Hospital admission rates due to GI infections were also lower in the probiotic group. No significant adverse effects related to probiotic use were reported during the study period. **Conclusion:** Probiotic supplementation in children aged 1 to 5 years significantly reduces the incidence, severity, and duration of gastrointestinal infections. Probiotics may be considered as a safe and effective adjunctive preventive measure in pediatric populations at risk for GI infections, especially in settings with high burden and limited resources.

Key words: Probiotics, Gastrointestinal infections, Children, Diarrhea, Pediatric health, Preventive strategy, Tertiary care, Karnataka, Gut microbiota, Antimicrobial resistance.

INTRODUCTION

Gastrointestinal (GI) infections remain a leading cause of morbidity and hospitalization in children worldwide, particularly in low- and middle-income countries like India. The burden is especially high among children aged 1 to 5 years, who are vulnerable due to their developing immune systems and increased exposure to environmental pathogens[1]. Acute diarrheal diseases, often caused by viral, bacterial, or parasitic agents, can lead to dehydration, malnutrition, and in severe cases, mortality if not appropriately managed. Despite significant improvements in public health measures and vaccination programs, GI infections continue to pose a significant health challenge in pediatric populations, particularly in resource-limited settings[2].

Traditionally, management of GI infections involves fluid replacement, nutritional support, and when necessary, antimicrobial therapy. However, the overuse and misuse of antibiotics have contributed to the growing problem of antimicrobial resistance, prompting the search for safer, cost-effective, and sustainable alternatives for prevention[3]. In recent years, probiotics—defined as live microorganisms which, when administered in adequate amounts, confer a health benefit on the host—have garnered significant attention in the prevention and management of gastrointestinal diseases. They function primarily by restoring and maintaining gut microbiota balance, enhancing mucosal barrier function, and modulating the host immune response[4].

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Several clinical studies and meta-analyses have demonstrated the potential benefits of probiotics in reducing the duration and severity of acute infectious diarrhea in children[5]. However, fewer studies have focused on the preventive role of probiotics in healthy children, particularly in the Indian context where the burden of diarrheal diseases is high and access to sanitation and clean drinking water may be limited. Furthermore, the efficacy of probiotics may vary depending on strain specificity, dosage, duration, and individual host factors, necessitating context-specific research[6].

This study was conducted at a tertiary care centre in Karnataka with the primary objective of assessing the preventive efficacy of probiotics in reducing the incidence of gastrointestinal infections in children aged 1 to 5 years. By evaluating real-world outcomes over a two-year period, this study aims to provide evidence that may support the integration of probiotics into routine pediatric care, especially in high-risk populations. Additionally, the study seeks to generate local data that can guide pediatricians and public health professionals in formulating preventive strategies against recurrent GI infections in children.

MATERIALS AND METHODS

This prospective observational study was carried out in the Department of Pediatrics at a tertiary care centre in Karnataka over a period of two years, from February 2022 to February 2024. The study enrolled a total of 1000 children aged between 1 and 5 years, who were either attending the outpatient department or admitted for various non-gastrointestinal complaints. After obtaining informed consent from parents or guardians, children were screened for eligibility based on inclusion and exclusion criteria. Children with chronic gastrointestinal diseases, immunodeficiency disorders, or those already on long-term probiotic or antibiotic therapy were excluded from the study.

The enrolled children were divided into two groups based on parental preference and clinical advisement: the intervention group, which received daily age-appropriate probiotic supplementation for a minimum duration of six months, and the control group, which did not receive any probiotic supplementation. The probiotics used were commercially available formulations containing commonly studied strains such as Lactobacillus rhamnosus GG, Bifidobacterium lactis, and Saccharomyces boulardii, administered either as sachets or drops as per standard pediatric dosage.

Both groups were monitored monthly through follow-up visits or telephonic consultations. Detailed clinical data including the number of episodes of gastrointestinal infections, their severity (mild, moderate, severe), duration of illness, requirement of hospital admission, and need for antibiotic therapy were recorded throughout the study period. Episodes were defined based on clinical presentation such as diarrhea (three or more loose stools in 24 hours), vomiting, abdominal pain, or fever suggestive of GI origin. Severity was assessed using a standardized scoring system incorporating duration of diarrhea, frequency of stools, dehydration status, and need for medical intervention.

All data were entered into a structured database and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize baseline characteristics, and comparative analysis was performed to assess differences in infection rates and clinical outcomes between the probiotic and non-probiotic groups. Statistical significance was determined using chi-square test or t-test as appropriate, with a p-value of less than 0.05 considered statistically significant. Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement.

RESULT

Out of 1000 children enrolled in the study, 500 received regular probiotic supplementation and 500 did not. The incidence of gastrointestinal infections was significantly lower in the probiotic group compared to the non-probiotic group. Additionally, children in the probiotic group experienced milder symptoms, shorter illness duration, and reduced hospitalization rates. The following tables detail the comparative analysis of demographic characteristics, infection rates, clinical profiles, and outcomes between the two groups.

Table 1: Children in both groups had comparable age and gender distribution, ensuring baseline homogeneity.

Table 1: Age and Gender Distribution among Study Groups

Age Group (Years)	Probiotic Group (n=500)	Non-Probiotic Group (n=500)
1–2	150 (30.0%)	155 (31.0%)
2–3	125 (25.0%)	120 (24.0%)
3–4	115 (23.0%)	110 (22.0%)
4–5	110 (22.0%)	115 (23.0%)
Gender		
Male	260 (52.0%)	270 (54.0%)
Female	240 (48.0%)	230 (46.0%)

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Table 2: Children receiving probiotics showed a significantly lower number of GI infection episodes.
Table 2: Incidence of Gastrointestinal Infections

Number of Episodes	Probiotic Group (n=500)	Non-Probiotic Group (n=500)
0	270 (54.0%)	120 (24.0%)
1	160 (32.0%)	190 (38.0%)
2	50 (10.0%)	110 (22.0%)
≥3	20 (4.0%)	80 (16.0%)

Table 3: Mean number of GI episodes per child was significantly lower in the probiotic group.
Table 3: Mean Number of Gastrointestinal Infection Episodes

Group	Mean ± SD
Probiotic	0.78 ± 0.61
Non-Probiotic	1.63 ± 1.02

Table 4: Children in the probiotic group experienced shorter duration of illness.
Table 4: Average Duration of Gastrointestinal Infection Episodes

Group	Mean Duration (Days) ± SD
Probiotic	2.6 ± 1.1
Non-Probiotic	4.1 ± 1.6

Table 5: Severity of illness was less among children receiving probiotics.
Table 5: Severity of Gastrointestinal Infections

Severity Level	Probiotic Group (n=230)	Non-Probiotic Group (n=380)
Mild	170 (73.9%)	190 (50.0%)
Moderate	50 (21.7%)	130 (34.2%)
Severe	10 (4.3%)	60 (15.8%)

Table 6: Probiotic group required less antibiotic treatment.
Table 6: Antibiotic Usage for Gastrointestinal Infections

Antibiotic Use	Probiotic Group (n=230)	Non-Probiotic Group (n=380)
Yes	60 (26.1%)	180 (47.4%)
No	170 (73.9%)	200 (52.6%)

Table 7: Fewer children required hospital admission in the probiotic group.
Table 7: Hospital Admissions Due to GI Infections

Hospitalization	Probiotic Group (n=230)	Non-Probiotic Group (n=380)
Required	12 (5.2%)	48 (12.6%)
Not Required	218 (94.8%)	332 (87.4%)

Table 8: Dehydration was significantly lower among children taking probiotics.
Table 8: Dehydration Status during GI Episodes

Dehydration Level	Probiotic Group (n=230)	Non-Probiotic Group (n=380)
None	190 (82.6%)	230 (60.5%)
Mild	30 (13.0%)	100 (26.3%)
Moderate	10 (4.3%)	40 (10.5%)
Severe	0 (0.0%)	10 (2.6%)

Table 9: Recurrence of infections was notably higher in the non-probiotic group.
Table 9: Recurrence of GI Infections within Study Period

Recurrence	Probiotic Group (n=500)	Non-Probiotic Group (n=500)
Yes (≥2 episodes)	70 (14.0%)	190 (38.0%)
No	430 (86.0%)	310 (62.0%)

Table 10: Nutritional status improved or was better maintained in the probiotic group.
Table 10: Nutritional Status Based on Weight-for-Age Percentiles

Nutritional Status	Probiotic Group (n=500)	Non-Probiotic Group (n=500)
Normal (≥50th percentile)	310 (62.0%)	260 (52.0%)
Mild Underweight	130 (26.0%)	150 (30.0%)

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Moderate Underweight	50 (10.0%)	70 (14.0%)
Severe Underweight	10 (2.0%)	20 (4.0%)

DISCUSSION

This study provides significant evidence supporting the role of probiotics in preventing gastrointestinal infections among children aged 1 to 5 years. Conducted over a two-year period at a tertiary care center in Karnataka, the study revealed that children who received regular probiotic supplementation had notably fewer episodes of gastrointestinal infections compared to those who did not. The reduction in the number, severity, and duration of infections was statistically significant, highlighting the prophylactic potential of probiotics in this vulnerable pediatric age group[7,8].

The incidence of GI infections was markedly lower in the probiotic group, with 54% of children experiencing no infection during the study period, compared to only 24% in the non-probiotic group[9]. Moreover, the mean number of infection episodes per child was almost halved in the probiotic group. These findings are consistent with previous research suggesting that probiotics can enhance mucosal immunity, competitively inhibit pathogen adhesion, and restore microbial balance in the gut[10].

Severity and clinical outcomes also differed between groups. Children receiving probiotics had milder infections, required fewer antibiotics, and had a significantly lower rate of hospitalization[11]. This is crucial in the current clinical landscape, where antimicrobial resistance is a major public health concern. The lower need for antibiotic intervention in the probiotic group underscores the utility of probiotics as a non-antibiotic strategy in managing mild to moderate gastrointestinal illnesses[12].

An additional finding of this study was the better nutritional status observed in the probiotic group. Since repeated episodes of diarrhea in children can lead to nutrient malabsorption and growth faltering, reducing such episodes with probiotics may indirectly promote healthier growth patterns[13,14]. Furthermore, the recurrence rate of infections was significantly lower in the probiotic group, suggesting a sustained beneficial effect with regular supplementation.

Importantly, probiotics were found to be safe and well-tolerated, with minimal and self-limiting adverse effects[15,16]. This reinforces their suitability for inclusion in routine pediatric dietary interventions, especially in settings where children are at high risk of repeated infections due to poor sanitation, inadequate access to clean water, or malnutrition[17,18].

Overall, this study supports the preventive role of probiotics in pediatric healthcare and provides compelling local data that can aid in forming clinical and public health policies. Given the high burden of gastrointestinal diseases in children in India, incorporating probiotics—particularly as part of early nutrition or public health programs—may reduce disease burden, improve child health outcomes, and decrease healthcare costs. However, further large-scale randomized controlled trials with strain-specific analysis would help refine probiotic recommendations tailored to the Indian pediatric population.

CONCLUSION

In conclusion, this study demonstrates that probiotics play a significant role in preventing gastrointestinal infections in children aged 1 to 5 years. Regular probiotic supplementation led to a marked reduction in the incidence, severity, and duration of gastrointestinal infections compared to the non-probiotic group. Additionally, probiotics contributed to fewer hospital admissions, less need for antibiotic treatment, and better overall nutritional status in the probiotic group.

The findings of this study highlight the safety and efficacy of probiotics as a preventive measure, particularly in high-risk pediatric populations, and support their potential integration into routine pediatric care. Given the low cost, ease of administration, and minimal side effects associated with probiotics, their use could be a valuable strategy in reducing the burden of gastrointestinal diseases, improving child health, and minimizing healthcare costs in resource-limited settings like India.

Further research, particularly large-scale randomized controlled trials, is needed to explore optimal probiotic strains, dosages, and long-term effects in diverse pediatric populations. Nevertheless, the results of this study strongly advocate for the incorporation of probiotics in preventive healthcare programs aimed at improving gastrointestinal health in children.

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