



Effectiveness of Probiotic Supplementation in Reducing the Duration and Recurrence of Acute Diarrhea in Children Under Five Years: A Retrospective Study

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Abstract: Background: Acute diarrhea is a major cause of morbidity and mortality among children under five years of age, particularly in developing countries. **Objective:** To evaluate the effectiveness of probiotic supplementation in reducing the duration and recurrence of acute diarrhea in children under five years of age. **Methods:** This observational study was conducted at Paediatrics Department of Mayo Hospital, Lahore from August 2025 to November 2025, included 235 children aged 6 months to 5 years presenting with acute diarrhea. Participants were randomly divided into two groups. The intervention group received probiotic supplementation in addition to standard treatment, while the control group received standard treatment alone, including oral rehydration therapy and zinc supplementation. **Results:** The mean duration of diarrhea in the probiotic group was 3.2 ± 1.1 days compared with 4.5 ± 1.4 days in the control group, showing a statistically significant reduction ($p < 0.001$). Recurrence of diarrhea within four weeks occurred in 16.1% of children in the probiotic group compared with 32.5% in the control group ($p = 0.004$). **Conclusion:** Probiotic supplementation significantly reduced both the duration and recurrence of acute diarrhea in children under five years of age. The findings suggest that probiotics may be an effective adjunct to standard management in improving clinical outcomes in pediatric diarrheal illness.

Keywords: acute diarrhea, probiotics, children under five, duration of diarrhea, recurrence, pediatric gastroenteritis

INTRODUCTION

Acute diarrhea is among the major causes of morbidity and mortality in children below the age of five years, especially in the developing world [1]. It is typified by the passage of three or more loose or watery stools in any 24-hour period and is usually

associated with viral, bacterial, or parasitic infections [2]. Diarrheal diseases are associated with a considerable share of hospitalizations among children worldwide and are also a major cause of child mortality, particularly in those parts of the world

where access to clean water, toilets, and health centers is restricted [3]. Children below the age of five are highly susceptible to the disease because of an inadequate immune system, malnutrition, and susceptibility to infectious diseases. The global health estimates indicate that diarrheal diseases are still a leading cause of death among children under the age of five, especially in countries that are low- and middle-income countries [4]. Despite the immense gains in mortality rates by way of enhancing the health of the people and the oral rehydration therapy, the adverse effects on the mortality rates are still heavy. Repeated bouts of diarrhea in most regions in Asia and Africa lead to chronic malnutrition, stunting, and poor immune response. All these aspects form a vicious circle in which malnutrition exposes children to infections, and infections exacerbate malnutrition [5].

The effects of acute diarrhea among young children go beyond the immediate disease. Regular outbreaks may cause dehydration, electrolyte imbalance, malnutrition, poor physical development, and retarded cognitive development. The recurrent diarrheal diseases also pose significant financial burden on families and health care systems in terms of frequent doctor visits, hospitalization expenses, and medical prescriptions. Thus, the strategies focused not only on the treatment but also on the reduction of the duration and frequency of acute episodes is necessary to improve the outcomes of child health [6]. The main treatment for acute diarrhea is to prevent dehydration and ensure adequate nutrition. Oral rehydration therapy remains the mainstay of treatment and has substantially reduced mortality from diarrheal diseases. Zinc supplementation should also be prescribed, as it has been shown to reduce the severity and duration of diarrheal episodes and enhance immune function [7]. Nevertheless, although these treatment methods are effective in preventing dehydration and complications, they do not significantly reduce the duration of diarrhea or eliminate recurrence, particularly in children who are frequently exposed to infectious agents. Over the past few years, probiotics have become one of the most promising adjunctive therapies for the management of gastrointestinal disorders, such as acute diarrhea [8]. Probiotics can be described as living micro-organisms that when taken in sufficient quantities, have health benefits to the host. Most of these microorganisms, belonging to the *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces* species, help restore the balance of the intestinal microbiota, which can be disturbed in cases of infection [9]. A healthy intestinal microbial environment has been described to be a key to healthy digestion, immunity and defense against pathogenic organisms. The positive impact of probiotics on diarrheal diseases can be explained by several mechanisms [10]. Probiotics can suppress the growth

of pathogenic microorganisms through the production of antimicrobial substances and by competing with harmful bacteria for adhesion sites on the intestinal mucosa. They also aid to increase the intestinal barrier function to avoid the invasion of pathogens and toxins [11]. Moreover, probiotics have been reported to activate the host immune response by enhancing immunoglobulin synthesis and modulating inflammatory responses. These mechanisms can be involved in the faster diarrheal symptoms resolution and recovery through probiotic supplementation [12].

Objective

To evaluate the effectiveness of probiotic supplementation in reducing the duration and recurrence of acute diarrhea in children under five years of age.

METHODOLOGY

This observational study was conducted at Paediatrics Department of Mayo Hospital, Lahore from August 2025 to November 2025, included 235 children aged 6 months to 5 years presenting with acute diarrhea. The consecutive non-probability sampling method was used to enroll the participants who met the eligibility requirements and randomly assigned them into two groups. The study included children aged 6 months to 5 years with acute diarrhea, i.e. the passage of three or more loose or watery stools within a 24-hour period lasting less than 14 days. The children that had their parents or guardians informed written consent prior to participation were enrolled. Severely dehydrated children that needed intensive control were not included in the research. Cases of diarrhea that persisted longer than 14 days, cases of gastrointestinal disorders that were congenital, or chronic systemic diseases were also excluded. The study was not conducted on children who were probiotic treated in the last two weeks and those with severe malnourishment or immunocompromised diseases.

Data Collection

Eligible children were enrolled in the study after receiving the permission of the institutional ethical review committee and informed consent of the parents or guardians. With a structured pro forma, baseline demographic and clinical data such as age, gender, nutritional status, and duration of diarrhea prior to presentation, and stool frequency were collected. The subjects were divided into two groups randomly. The intervention group was provided with the normal management of acute diarrhea and probiotics supplement whereas the control group was just provided with normal treatment. The usual treatment was oral rehydration therapy, zinc addition, and the further feeding by the recommended pediatric guidelines. The intervention group of children was given a probiotic preparation of beneficial microorganisms, such as *Lactobacillus* or

Bifidobacterium species, at the age-appropriate dose for each duration, as per pediatric guidelines. Daily clinical progress was observed throughout the treatment period, and the length of diarrhea was noted starting with the date of treatment until the time when the last undeveloped stool was passed, and the first formed stool came in. All the members were monitored four weeks following recovery to determine the level of diarrheal recurrence, and other symptoms or complications, and documented any other hospitalization during the follow-up period.

Data Analysis

The collected data were entered and analyzed using SPSS version 24. Continuous variables such as age and duration of diarrhea were presented as mean $\pm$ standard deviation, while categorical variables such as gender and recurrence of diarrhea were expressed as frequencies and percentages. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Data were collected from 235 patients; the mean age of the participants was 2.3 ± 1.2 years. Most of the children were in the 1–3 years age group, accounting for 112 (47.7%) cases, followed by 6–12 months with 68 (28.9%) children and 4–5 years with 55 (23.4%) children. Male children constituted 132 (56.2%) of the study population, while females accounted for 103 (43.8%). Regarding treatment allocation, 118 (50.2%) children received probiotic supplementation in addition to standard therapy, whereas 117 (49.8%) children received standard therapy alone.

Table 1: Demographic Characteristics and Treatment Distribution of Children with Acute Diarrhea (n = 235)

Variable	Category	n (%) / Mean $\pm$ SD
Age (years)	—	2.3 ± 1.2
Age Group	6–12 months	68 (28.9)
	1–3 years	112 (47.7)
	4–5 years	55 (23.4)
Gender	Male	132 (56.2)
	Female	103 (43.8)
Treatment Group	Probiotic supplementation + standard therapy	118 (50.2)
	Standard therapy alone	117 (49.8)

The mean duration of diarrhea was significantly shorter in the probiotic group (3.2 ± 1.1 days) compared with the control group (4.5 ± 1.4 days), showing a statistically significant difference ($p < 0.001$). Recurrence of diarrhea within four weeks occurred in 19 (16.1%) children in the probiotic group compared with 38 (32.5%) in the control group ($p = 0.004$). Improvement in stool frequency within 48 hours was observed in 87 (73.7%) children receiving probiotics, while only 61 (52.1%) children in the control group showed similar improvement ($p = 0.001$). Furthermore, hospitalization was required in 14 (11.9%) children in the probiotic group compared with 27 (23.1%) children in the control group ($p = 0.021$), indicating better clinical outcomes among those receiving probiotic supplementation.

Table 2: Comparison of Clinical Outcomes Between Probiotic and Control Groups (n = 235)

Variable	Category	Probiotic Group (n = 118)	Control Group (n = 117)	p-value
Duration of diarrhea (days)	Mean $\pm$ SD	3.2 ± 1.1	4.5 ± 1.4	<0.001
Recurrence of diarrhea within 4 weeks	Yes	19 (16.1)	38 (32.5)	0.004
	No	99 (83.9)	79 (67.5)	
Improvement in stool frequency	Improved within 48 hours	87 (73.7)	61 (52.1)	0.001
	Improved after 48 hours	31 (26.3)	56 (47.9)	
Hospitalization	Required hospitalization	14 (11.9)	27 (23.1)	0.021
	Managed as outpatient	104 (88.1)	90 (76.9)	

Among the 235 participants, 102 (43.4%) children presented with no dehydration, 89 (37.9%) had mild dehydration, and 44 (18.7%) had moderate dehydration at the time of admission.

Table 3: Dehydration Status at Presentation

Dehydration Status	n (%)
No dehydration	102 (43.4)
Mild dehydration	89 (37.9)
Moderate dehydration	44 (18.7)

DISCUSSION

Acute diarrhea is among the leading causes of disease in children below age five years and still plays a major role in causing pediatric morbidity in most countries across the world. The current research determined the efficacy of probiotics supplementation in shortening the onset and recurrence of acute diarrhea in children under the age of five. This was shown to be the case since children who were given probiotics together with the standard therapy had considerably shorter diarrhea period and lower rates of recurrence than those who were given standard therapy alone. The average duration of the probiotic group was found to be 3.2 ± 1.1 days as opposed to the control group which was 4.5 ± 1.4 days, which implied that there was a statistically significant shortening of the period of symptoms. These results fall in line with previous studies which found that probiotics supplementation has a significant potential to shorten the length of acute diarrheal episodes in children [12-14]. Past studies have indicated that probiotics can be used to restore intestinal microbiota balance that is altered during infection, thereby improving recovery and reducing disease severity. The beneficial microorganisms found in probiotic preparations might prevent the proliferation of pathogenic bacteria, produce antimicrobial agents, and enhance intestinal barrier function [15].

The findings of the current research also included a much lower rate of recurrence of diarrhea in children under probiotic supplementation. In the probiotic group, 16.1% of children experienced recurrence within four weeks, compared with 32.5% in the control group. The results of these studies corroborate the assumption that probiotics could be of great relevance to the prevention of recurrent gastrointestinal infections by enhancing intestinal immunity and maintaining a healthy gut microbial ecosystem [16]. Past studies have also found that probiotic treatment can decrease the rate of recurrent diarrheal episodes by enhancing mucosal immunity and developing colonization resistance against pathogenic organisms. The other significant finding of this study was the increased rate of improvement in stool frequency among children treated with probiotics [17]. In the probiotic group, a larger percentage of children improved within 48 hours, compared with the control group. This observation aligns with previous research showing that probiotic microorganisms can accelerate clinical recovery by improving intestinal absorption, reducing

inflammation, and reducing the activity of pathogenic microorganisms. Qualitative recovery of intestinal function could help achieve improved clinical outcomes and shorter hospitalization [18]. The process in which probiotics have their positive effects is multifactorial. Probiotics can generate antimicrobial compounds that inhibit pathogenic bacteria, outcompete pathogenic bacteria at their adhesion sites in the intestine, or stimulate the host's immune function. Moreover, probiotics could increase the synthesis of immunoglobulin A and other immune mediators, thereby preventing infection of the intestinal mucosa. The resulting outcome of these effect combinations is a boosted health of the intestine and a quick recovery of diarrheal illness [19]. Although such positive results have been achieved, the efficacy of probiotics may vary with specific strains, dosage, treatment duration, and etiology of diarrhea [20,21]. There are probiotic strains that have been proven to be better than others in the treatment of infectious diarrhea and more research is necessary to determine the most useful strains as well as the best treatment regimen to be adopted by the pediatric patients. The research also had several limitations that should be noted when interpreting the results. One, the research was carried out in one healthcare facility and this could compromise the extrapolation of the findings in other groups or healthcare facilities. Second, the time of the follow-up of assessing recurrence of diarrhea was limited to four weeks, and the extension of follow-up may give more accurate information about the long-term recurrence patterns. Third, the research failed to distinguish the concrete etiological agents of diarrhea that might affect the efficacy of probiotic treatment, including viral, bacterial, and parasitic infections.

CONCLUSION

It is concluded that probiotic supplementation, in addition to standard therapy, is effective in reducing both the duration and recurrence of acute diarrhea in children under 5 years of age. Children receiving probiotics experienced faster clinical recovery and fewer recurrent episodes compared with those receiving standard treatment alone. Therefore, probiotics may serve as a useful adjunct therapy in the management of acute diarrhea, thereby improving clinical outcomes and reducing disease burden among young children.

REFERENCES

1. Ali R. The use of probiotic with ORS and ORS only in children with acute diarrhea. *J Coll Physicians Surg Pak* 2019; 29(12):1179-1182.
2. Huang R, Xing HY, Liu HJ, Chen ZF, Tang BB. Efficacy of probiotics in the treatment of acute diarrhea in children: a systematic review and meta-analysis of clinical trials. *Transl Pediatr*. 2021 Dec;10(12):3248-3260. doi: 10.21037/tp-21-511. PMID: 35070839; PMCID: PMC8753473.
3. MOAMEN ABDEL FADIL ISMAIL, RANEEM FAHAD ALHARBI, RANA ALI HAKAMI, RAZAN MOHAMMED ALOTAIBI, REIMA ASSEM ALHAZMI, REEMA ALI ABU RASAIN, & ARWA EID SAEED ALSHAHRANI, AIAT OSAMA ELMABROUK HASSAN, ABDULMAJEED ALI ALSHEHRI, MOAAD ABOU SAFRAH, AMAL SALEH ALSOFYANY, FAJR ESSAM SAIFUDDIN, MOHAMMED ALI S ALBINAHMED. (2025). EFFECTIVENESS OF PROBIOTICS IN REDUCING THE DURATION OF ACUTE DIARRHEA IN CHILDREN: A SYSTEMATIC REVIEW. *TPM – Testing, Psychometrics, Methodology in Applied Psychology*, 32(S7 (2025): Posted 10 October), 263–271. <https://doi.org/10.5281/zenodo.17697549>
4. Yazar AS, Güven S, Dinleyici EÇ. Effects of zinc or synbiotic on the duration of diarrhea in children with acute infectious diarrhea. *Turk J Gastroenterol* 2016; 27:537-40.
5. Dinleyici EC, Dalgic N, Guven S, Metin O, Yasa O, Kurugol Z, et al. *Lactobacillus reuteri* DSM 17938 shortens acute infectious diarrhea in a pediatric outpatient setting. *J Pediatr (Rio J)* 2015; 91:392-6.
6. Urbanska M, Gieruszczak-Bialek D, Szajewska H. Systematic review with meta-analysis: *Lactobacillus reuteri* DSM 17938 for diarrhoeal diseases in children. *Aliment Pharmacol Ther* 2016; 43:1025-34.
7. Asmat S, Shaukat F, Asmat R, Bakhat HFSG, Asmat TM. Clinical efficacy comparison of *saccharomyces boulardii* and lactic acid as probiotics in acute pediatric diarrhea. *J Coll Physicians Surg Pak* 2018; 28:214-7.
8. Ullah MZ, Gul H, Asma B, Inayatullah, Rizwan M, Rehman SU. Efficacy of probiotics in outcome of acute watery diarrhea in children aged 06 months to 12 years admitted to the pediatrics department of Bacha Khan Medical Complex, Swabi. *Int J Pathol [Internet]*. 2025 Sep. 29 [cited 2026 Mar. 11];23(3):116-24. Available from: <https://jpathology.com/index.php/OJS/article/view/958>
9. Sadiq A, Bokhari H, Noreen Z, Asghar RM, Bostan N: Magnitude of Rotavirus A and *Campylobacter jejuni* infections in children with diarrhea in Twin cities of Rawalpindi and Islamabad, Pakistan. *BMC Infect Dis* 2019 Dec; 19:1-0.
10. Alharbi AA, Alalawi FM, Dabash SH, Alotaibi MD, Alsadah AM, Alshammari MN, Alshamry AN, Alosaimi MA, Hemili OM, Messawa HY, Albeshar SA: Electrolyte Imbalances and Dehydration in Children: Biochemical Insights and Nursing Interventions in ICU Settings-An Updated Review. *J Med Chem Sci* 2024 Nov 1; 7(11):1708-21.
11. Guarino A, Aguilar J, Berkley J, Broekaert I, Vazquez-Frias R, Holtz L, Vecchio AL, Meskini T, Moore S, Medina JF, Sandhu B: Acute gastroenteritis in children of the world: what needs to be done?. *J Pediatr Gastroenterol Nutr* 2020 May 1; 70(5):694-701.
12. Wei Q, Song LY, Rao R, Yang HW, Wen YP, Lv L, Wang L: The Impact of Combined Therapy with *Lactobacillus acidophilus* and Montmorillonite Powder on the Inflammatory Response in Pediatric Rotavirus Enteritis. *Int Arch Allergy Immunol* 2024; 1-3.
13. Haidry B, Ahmed N, Saddique T, Abbasi M, Yaqoob M, Rasheed N: Clinical efficacy of use of probiotics in children with acute watery Diarrhea. *Ann PIMS Shaheed Zulfiqar Ali Bhutto Med Univ* 2024 May 7; 20(2):186-91.
14. Bhat S, Shreekrishna GN, Savio CD: Efficacy of probiotics in acute diarrhoea in children. *Int J Contemp Pediatr* 2018 Jul; 5(4):1646-50.
15. Raza W, Mahmood T, Atta L, Hassan S, Ullah S, Ali S, Muhammad M, Ahmad N: Comparative Effectiveness of Zinc Supplementation Combined with Probiotic Therapy Versus Zinc Alone in Reducing Acute Diarrhea Duration, Severity, and Recurrence Rates in Pediatric Populations: A Meta-Analysis. *Indus J Biosci Res* 2024 Nov 30; 2(02):681-9.
16. Huang R, Xing HY, Liu HJ, Chen ZF, Tang BB. Efficacy of probiotics in the treatment of acute diarrhea in children: a systematic review and meta-analysis. *Transl Pediatr*. 2021;10(12):3248-3260. doi:10.21037/tp-21-511.
17. Johnston BC, Ma SSY, Goldenberg JZ, Thorlund K, Vandvik PO, Loeb M, et al. Probiotics for the prevention of *Clostridium difficile*-associated diarrhea: a systematic review and meta-analysis. *Ann Intern Med*. 2012;157(12):878-888. doi:10.7326/0003-4819-157-12-201212180-00563.
18. Mai TT, Thi Thu P, Thi Hang H, et al. Efficacy of probiotics on digestive disorders and acute respiratory infections: a controlled clinical trial in young Vietnamese children. *Eur J Clin Nutr*.

2021;75(3):513-520. doi:10.1038/s41430-020-00754-9.

19. Plaza-Díaz J, Ruiz-Ojeda FJ, Gil-Campos M, Gil A. Immune-mediated mechanisms of action of probiotics and synbiotics in treating pediatric intestinal diseases. *Nutrients*. 2018;10(1):42. doi:10.3390/nu10010042.
20. Minaz A, Alam R, Jiwani U, Vadsaria K, Khan A, Ishaq A, Sultan S, Mohsin M, Sharif A, Nisar YB, Das JK: Efficacy of probiotics for treatment of acute or persistent diarrhoea in children from birth till 10 years: Systematic review and meta-analysis. *J Glob Health* 2024 Dec 20; 14:04236.
21. Shah SA, Naz S, Jabeen F, Rashid MA, Rahman A, Khan Z: Comparison of Bacterial Probiotics (Bifidobacterium and Lactobacillus) Versus Fungal Probiotics (Saccharomyces) in Treating Acute Diarrhea in Children Aged 6 Months to 5 Years. *J Ayub Med Coll Abbottabad* 2024; 36(3):537-41.