JHWCR JOURNAL OF HEALTH, WELLNESS AND COMMUNITY RESEARCH 3007-0570

https://doi.org/10.61919/2ztr4d40

Original Article

Comparison of Reduction in Stool Frequency As Effect of Probiotics (Bacillus clausii) And Antisecretory (Racecadotril) in Acute Watery Diarrhea With Some / Mild Dehydration

Maryam Ikram[1], Fatima Farooq[2], Allina Mukhtar[3], Fareeha Abbas[4], Khadija Kamal[5], Sana Rehman[6]

[1] Senior Registrar Pediatric, Azra Naheed Medical College, Lahore, Pakistan
[2] Consultant Paediatrician, DHQ Hospital, Chiniot, Pakistan
[3] Consultant Pediatrician / Women Medical Officer, District Head Quarter Hafizabad, Hafizabad, Pakistan
[4] Senior Registrar Pediatric, Dr Faisal Masood Teaching Hospital, Sargodha, Pakistan
[5] Consultant Pediatrician / Medical Officer, Omer Hospital Lahore, Lahore, Pakistan
[6] Assistant Professor Pediatric, Azra Naheed Medical College, Lahore, Pakistan

***Corresponding author: Maryam Ikram, maryamikram.9@gmail.com**

"Cite this Article" Received: 01 April 2026; **Accepted**: 02 May 2026; **Published**: 18 May 2026

Author Contributions: Concept: MI, SR; Design: MI, FF; Data Collection: AM, FA, KK; Analysis: MI, FF; Drafting: MI, FF, AM, FA, KK, SR.. **Ethical Approval**: Azra Naheed Medical College, Lahore, Pakistan. **Informed Consent**: Written informed consent was obtained from all participants; **Conflict of Interest**: The authors declare no conflict of interest. **Funding**: No external funding; **Data Availability**: Available from the corresponding author on reasonable request; **Acknowledgments**: N/A.

ABSTRACT

Background: Acute watery diarrhea remains a common cause of morbidity among young children, and adjunctive therapies that reduce stool frequency may improve clinical recovery when used with oral rehydration therapy. **Objective:** To compare the effectiveness of Bacillus clausii probiotic therapy and racecadotril in reducing stool frequency among children with acute watery diarrhea and mild dehydration. **Methods:** This randomized controlled study was conducted in the Department of Pediatrics, Chaudhary Muhammad Akram Teaching and Research Hospital, Lahore, from July 30, 2023, to January 29, 2024. Ninety children aged 1–5 years with acute watery diarrhea, at least ten loose stools per day, and mild dehydration were enrolled and allocated into two equal groups. Group A received Bacillus clausii plus oral hypo-osmolar rehydration solution, while Group B received racecadotril plus oral hypo-osmolar rehydration solution. Stool frequency was recorded during follow-up, and treatment response was defined as more than 50% reduction in loose stool frequency. **Results:** The mean age was 3.32 ± 1.48 years. Reduction in stool frequency was achieved in 43 children (95.6%) in Group A compared with 31 children (68.9%) in Group B (RR 1.39, 95% CI 1.12–1.73; p=0.001). Mean loose stool frequency was also lower in Group A at 24, 48, and 72 hours. **Conclusion:** Bacillus clausii plus oral rehydration solution was associated with greater reduction in stool frequency than racecadotril plus oral rehydration solution in children with acute watery diarrhea and mild dehydration. **Keywords:** Acute watery diarrhea; Bacillus clausii; racecadotril; stool frequency; probiotics; oral rehydration solution; mild dehydration.

INTRODUCTION

Acute diarrhea remains a major cause of morbidity among children under five years of age and continues to impose a substantial clinical and economic burden on families, particularly in resource-limited settings. It is commonly characterized by the passage of frequent loose or watery stools and may be accompanied by abdominal discomfort, reduced oral intake, and varying degrees of dehydration (1,2). Although oral rehydration therapy remains the cornerstone of management, it does not directly shorten the duration of diarrhea or reduce stool frequency, which are outcomes of practical importance for caregivers, clinicians, and health systems. Inappropriate antibiotic use for acute diarrhea has also contributed to antimicrobial resistance, emphasizing the need for safe, evidence-based adjunctive therapies that can reduce symptoms without promoting unnecessary antimicrobial exposure (3,4).

Adjunctive treatment strategies for acute watery diarrhea have therefore focused on interventions that can reduce stool output, improve intestinal recovery, and support restoration of normal gastrointestinal function. Probiotics are one such option because they may modify and stabilize intestinal microbiota, enhance colonization resistance, strengthen gut barrier function, and influence immune responses during infectious gastrointestinal illness. Commonly studied probiotic organisms include Lactobacillus, Bifidobacterium, Saccharomyces, and Bacillus species, with potential mechanisms including competitive inhibition of pathogens, modulation of mucosal immunity, and improvement of epithelial barrier integrity (2,5). Bacillus clausii is of particular interest because its spore-forming structure allows survival through gastric acidity and subsequent germination in the intestine, where it may contribute to restoration of microbial balance during diarrheal illness (6).

Clinical evidence regarding probiotics in pediatric acute diarrhea remains mixed. Some trials and reviews suggest that selected probiotic strains may reduce stool frequency, improve clinical recovery, and shorten hospitalization when used early in the diarrheal episode, while other studies show limited or strain-specific benefit. A combination probiotic trial reported greater recovery from diarrhea compared with control treatment, defined by improvement in stool frequency and consistency within 24–48 hours (7). Similarly, systematic evidence has suggested possible benefit of Bacillus clausii as an adjunct to oral rehydration therapy, with or without zinc, although heterogeneity among studies and differences in probiotic strain, dose, timing of administration, and co-interventions limit the certainty of conclusions (8). These variations highlight the need for locally relevant comparative evidence in clearly defined pediatric populations.

Racecadotril is another adjunctive treatment used in acute watery diarrhea. It acts as an antisecretory agent by reducing intestinal fluid and electrolyte loss without reducing gut motility, thereby offering a theoretical advantage over antimotility drugs in children. Previous pediatric studies and reviews have reported that racecadotril, when added to oral rehydration therapy, may reduce stool output and shorten the duration of acute diarrhea compared with placebo or standard therapy alone (9). However, comparative evidence between racecadotril and probiotics has not been uniform. Some studies have favored racecadotril for more rapid stool normalization and reduced stool frequency, whereas others have reported greater clinical improvement with probiotics, suggesting that treatment effects may depend on population characteristics, diarrhea severity, timing of presentation, selected probiotic strain, and background standard care (10).

Despite the availability of both probiotics and antisecretory therapy in pediatric practice, uncertainty remains regarding which adjunctive option provides greater reduction in stool frequency among young children with acute watery diarrhea and mild dehydration. This gap is clinically relevant because stool frequency is a practical marker of disease burden, caregiver concern, dehydration risk, and treatment response. Direct comparison of Bacillus clausii and racecadotril in children aged one to five years receiving oral rehydration therapy may help inform rational adjunctive treatment selection in routine pediatric settings. Therefore, the present study aimed to compare the frequency of clinically meaningful reduction in stool frequency among children with acute watery diarrhea and mild dehydration treated with Bacillus clausii plus oral rehydration therapy versus racecadotril plus oral rehydration therapy.

MATERIALS AND METHODS

This randomized controlled study was conducted in the Department of Pediatrics, Chaudhary Muhammad Akram Teaching and Research Hospital, Lahore, over a six-month period from July 30, 2023, to January 29, 2024. The study was designed to compare the clinical effectiveness of probiotic therapy with Bacillus clausii versus antisecretory therapy with racecadotril as adjuncts to oral hypo-osmolar rehydration solution in children presenting with acute watery diarrhea and mild dehydration. The primary outcome was a clinically meaningful reduction in stool frequency, defined as more than 50% reduction in the number of loose stools within the observation period after initiation of treatment.

Children aged one to five years presenting with acute watery diarrhea were enrolled after assessment for eligibility. Acute watery diarrhea was defined as the passage of three or more loose or liquid stools per day, or stool frequency greater than usual for the child, with illness duration of less than 14 days. Children were eligible if they had at least ten loose stools per day at presentation, had mild or some dehydration, were afebrile, and had received routine immunization according to the Expanded Programme on Immunization schedule. Children were excluded if they had fever, bloody diarrhea, diarrhea lasting more than two weeks, severe dehydration, or prior use of oral antibiotics for the current illness episode.

A total sample size of 90 children was calculated using a 95% confidence level, 80% study power, and expected stool-frequency reduction rates of 96.9% and 79.6% between the two comparison groups. Eligible participants were recruited using consecutive non-probability sampling until the required sample size was achieved. After written informed consent was obtained from parents or legal guardians, demographic and clinical information was recorded on a predesigned data collection form, including age, sex, duration of diarrhea, hydration status, baseline stool frequency, and daily stool frequency after treatment initiation.

Participants were allocated into two equal groups of 45 children each. Group A received Bacillus clausii probiotic therapy in addition to oral hypo-osmolar rehydration solution, while Group B received racecadotril in addition to oral hypo-osmolar rehydration solution. Allocation was performed according to registration number sequence, with children having odd registration numbers assigned to Group A and children having even registration numbers assigned to Group B. Both groups received standard supportive management for acute watery diarrhea, including continued oral rehydration according to clinical requirement and caregiver counseling regarding fluid intake and monitoring of stool frequency.

The main exposure variable was treatment group, categorized as probiotic therapy with Bacillus clausii plus oral rehydration solution or antisecretory therapy with racecadotril plus oral rehydration solution. The principal outcome variable was reduction in loose stool frequency, operationally defined as more than 50% reduction from baseline stool frequency during follow-up. Additional quantitative variables included age, duration of diarrhea before presentation, number of loose stool episodes at 24, 48, and 72 hours, and final number of loose stools recorded at the end of follow-up. Qualitative variables included sex and reduction status, categorized as achieved or not achieved according to the operational definition.

Data were collected prospectively after enrollment. Stool frequency was recorded at baseline and then reassessed at 24-hour intervals during follow-up. Parents or caregivers were instructed to report each loose stool episode, and the recorded information was reviewed by the study team using the structured proforma. Hydration status was assessed clinically at presentation and monitored during treatment. The same operational definitions were applied across both study groups to reduce measurement variability, and data entries were checked for completeness before analysis.

Data were analyzed using SPSS version 23.0. Quantitative variables, including age, duration of diarrhea, stool frequency at different time points, and final stool frequency, were summarized as mean and standard deviation. Qualitative variables, including sex and reduction in stool frequency, were summarized as frequencies and percentages. The two treatment groups were compared for baseline demographic and clinical characteristics. The chi-square test was used to compare the proportion of children achieving reduction in stool frequency between groups. Relative risk with 95% confidence interval was calculated for the primary binary outcome. Independent-sample comparisons were used for continuous variables where appropriate, and a p-value of ≤ 0.05 was considered statistically significant.

Stratified analysis was performed to assess whether the treatment effect differed by age group, sex, and duration of symptoms before presentation. Post-stratification chi-square testing was applied to compare stool-frequency reduction between treatment groups within each stratum. The analysis was conducted using the available complete data for enrolled participants. Data integrity was maintained by using a

uniform data collection form, applying predefined operational definitions, reviewing entries before analysis, and using the same outcome assessment approach for both treatment groups.

The study was conducted after approval from the hospital ethics review committee. Written informed consent was obtained from the parents or legal guardians of all enrolled children before participation. Participant confidentiality was maintained throughout data collection and analysis, and all children received standard supportive care for acute watery diarrhea according to clinical need.

RESULTS

A total of 90 children with acute watery diarrhea and mild dehydration were analyzed, with 45 participants in the Bacillus clausii plus oral hypo-osmolar rehydration solution group and 45 participants in the racecadotril plus oral hypo-osmolar rehydration solution group. The mean age of the study population was 3.32 ± 1.48 years, with comparable age distribution between Group A and Group B (3.33 ± 1.45 vs 3.31 ± 1.52 years; mean difference 0.02 years, 95% CI −0.60 to 0.64; p=0.949). The mean duration of diarrhea before presentation was also comparable between the two groups (8.13 ± 2.57 vs 8.91 ± 2.70 days; mean difference −0.78 days, 95% CI −1.88 to 0.32; p=0.164). Male children comprised 57.8% of Group A and 53.3% of Group B, while female children comprised 42.2% and 46.7%, respectively.

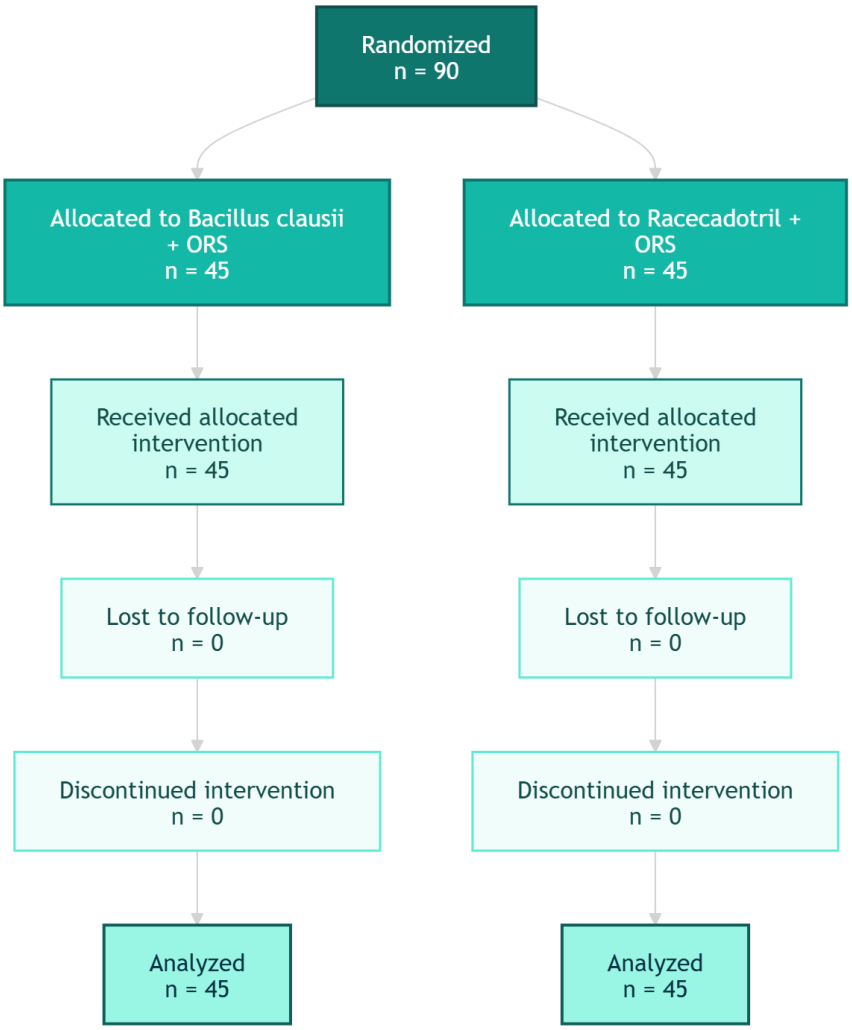

Figure 1. CONSORT Flow Diagram of Participant Allocation and Analysis After Randomization

The CONSORT flow diagram summarizes participant progression after randomization. A total of 90 children were randomized into two equal treatment arms: 45 children received Bacillus clausii plus oral rehydration solution, and 45 children received racecadotril plus oral rehydration solution. All randomized participants received their allocated intervention, with no reported loss to follow-up and no

reported discontinuation in either group. The final analysis included 45 children in each group, maintaining complete allocation-to-analysis continuity across both study arms.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Groups

Variable	Group A: Bacillus clausii + ORS (n=45)	Group B: Racecadotril + ORS (n=45)	Total (n=90)	Mean Difference	p-value
Age, years, mean ± SD	3.33 ± 1.45	3.31 ± 1.52	3.32 ± 1.48	Mean difference: 0.02 years; 95% CI −0.60 to 0.64	0.949
Duration of diarrhea, days, mean ± SD	8.13 ± 2.57	8.91 ± 2.70	8.52 ± 2.65	Mean difference: −0.78 days; 95% CI −1.88 to 0.32	0.164
Male sex, n (%)	26 (57.8%)	24 (53.3%)	50 (55.6%)	Difference: 4.5 percentage points	
Female sex, n (%)	19 (42.2%)	21 (46.7%)	40 (44.4%)	Difference: −4.5 percentage points	

During follow-up, Group A showed a consistently greater decline in loose stool frequency than Group B at each recorded time point. At 24 hours, the mean number of loose stools was 5.51 ± 0.51 in Group A compared with 6.73 ± 0.45 in Group B, corresponding to a mean difference of −1.22 stools/day. By 48 hours, the difference widened to 3.31 ± 1.08 vs 6.09 ± 0.76 stools/day, with a mean difference of −2.78 stools/day. At 72 hours, Group A maintained a lower stool frequency than Group B (1.98 ± 0.81 vs 4.89 ± 0.93 stools/day; mean difference −2.91 stools/day). The final recorded loose stool frequency was also lower in Group A (1.27 ± 0.45) than in Group B (2.76 ± 0.43), with a mean difference of −1.49 stools/day.

Table 2. Comparison of Loose Stool Frequency During Follow-up

Time Point / Outcome	Group A: Bacillus clausii + ORS (n=45), Mean ± SD	Group B: Racecadotril + ORS (n=45), Mean ± SD	Mean Difference	95% CI for Mean Difference	p-value
Loose stools at 24 hours	5.51 ± 0.51	6.73 ± 0.45	−1.22	−1.42 to −1.02	<0.0001
Loose stools at 48 hours	3.31 ± 1.08	6.09 ± 0.76	−2.78	−3.17 to −2.39	<0.0001
Loose stools at 72 hours	1.98 ± 0.81	4.89 ± 0.93	−2.91	−3.28 to −2.55	<0.0001
Final loose stool frequency	1.27 ± 0.45	2.76 ± 0.43	−1.49	−1.67 to −1.31	<0.0001

The primary clinical outcome, defined as reduction in loose stool frequency according to the prespecified operational definition, was achieved by 43 of 45 children (95.6%) in Group A compared with 31 of 45 children (68.9%) in Group B. The absolute difference in response rate was 26.7 percentage points, favoring Bacillus clausii. The relative likelihood of achieving reduction in stool frequency was 1.39 times higher in Group A than in Group B (RR 1.39, 95% CI 1.12–1.73; p=0.001). Only 2 children (4.4%) in Group A failed to achieve the defined reduction compared with 14 children (31.1%) in Group B.

Table 3. Primary Outcome: Reduction in Loose Stool Frequency Between Study Groups

Reduction in Loose Stool Frequency	Group A: Bacillus clausii + ORS (n=45)	Group B: Racecadotril + ORS (n=45)	Total (n=90)	Chi-square	Relative Risk	95% CI	p-value
Yes	43 (95.6%)	31 (68.9%)	74 (82.2%)	10.946	1.39	1.12–1.73	0.001
No	2 (4.4%)	14 (31.1%)	16 (17.8%)				
Total	45 (100%)	45 (100%)	90 (100%)				

Stratified analysis showed that the greater reduction in loose stool frequency with Bacillus clausii was consistent across age, sex, and symptom-duration categories. Among children aged 1–2 years, reduction occurred in 21 of 21 children (100%) in Group A compared with 10 of 15 children (66.7%) in Group B (p=0.004). Among children aged 3–5 years, reduction occurred in 22 of 24 children (91.7%) in Group A compared with 21 of 30 children (70.0%) in Group B (p=0.049). In male children, response rates were 92.3% vs 62.5% in Groups A and B, respectively (p=0.011), while among female children, response rates were 100% vs 76.2% (p=0.023). The treatment difference also remained evident when stratified by

duration of symptoms, with response rates of 93.8% vs 55.6% among children presenting before 7 days and 96.6% vs 72.2% among those presenting at or after 7 days.

Table 4. Stratified Analysis of Reduction in Loose Stool Frequency by Age, Sex, and Duration of Symptoms

Stratification Variable	Subgroup	Reduction Status	Group A: Bacillus clausii + ORS	Group B: Racecadotril + ORS	Absolute Difference	p-value
Age group	1–2 years	Yes	21 (100%)	10 (66.7%)	33.3 percentage points	0.004
Age group	1–2 years	No	0 (0%)	5 (33.3%)		
Age group	3–5 years	Yes	22 (91.7%)	21 (70.0%)	21.7 percentage points	0.049
Age group	3–5 years	No	2 (8.3%)	9 (30.0%)		
Sex	Male	Yes	24 (92.3%)	15 (62.5%)	29.8 percentage points	0.011
Sex	Male	No	2 (7.7%)	9 (37.5%)		
Sex	Female	Yes	19 (100%)	16 (76.2%)	23.8 percentage points	0.023
Sex	Female	No	0 (0%)	5 (23.8%)		
Duration of symptoms	<7 days	Yes	15 (93.8%)	5 (55.6%)	38.2 percentage points	0.022
Duration of symptoms	<7 days	No	1 (6.2%)	4 (44.4%)		
Duration of symptoms	≥7 days	Yes	28 (96.6%)	26 (72.2%)	24.4 percentage points	0.009
Duration of symptoms	≥7 days	No	1 (3.4%)	10 (27.8%)		

Overall, children treated with Bacillus clausii plus oral rehydration solution demonstrated lower mean loose stool frequency at all follow-up intervals and a higher proportion achieving clinically meaningful reduction in stool frequency than children treated with racecadotril plus oral rehydration solution. The largest observed mean difference in stool frequency occurred at 72 hours, where Group A had approximately 2.91 fewer loose stools per day than Group B. The binary clinical endpoint also favored Group A, with an absolute response advantage of 26.7 percentage points and a relative response increase of 39% compared with Group B.

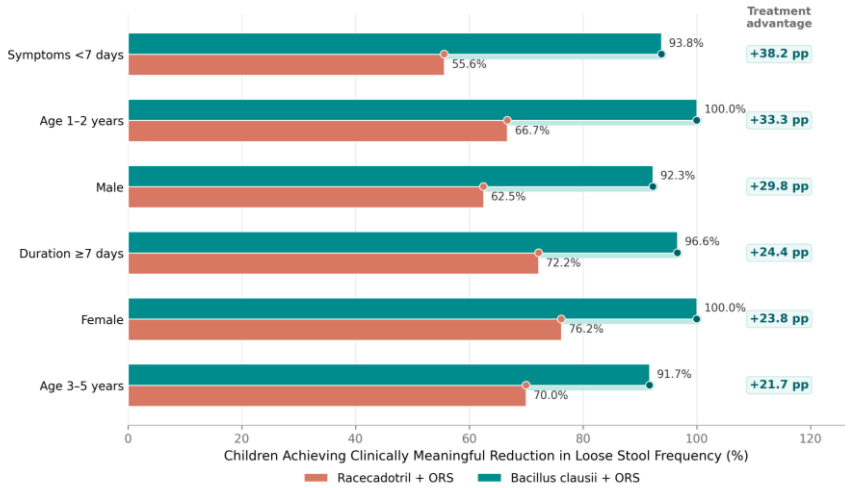

Figure 2. Subgroup Response Advantage of Bacillus clausii Plus ORS Compared With Racecadotril Plus ORS in Children With Acute Watery Diarrhea

Across all clinical subgroups, Bacillus clausii plus ORS showed higher response rates than racecadotril plus ORS, with the greatest treatment advantage observed among children presenting with symptoms for <7 days (93.8% vs 55.6%; +38.2 percentage points) and those aged 1–2 years (100.0% vs 66.7%; +33.3 percentage points). The advantage remained consistent among males (+29.8 percentage points), children with symptom duration ≥7 days (+24.4 percentage points), females (+23.8 percentage points), and children aged 3–5 years (+21.7 percentage points), indicating a broad and clinically meaningful response gradient favoring Bacillus clausii across demographic and symptom-duration strata.

DISCUSSION

The present study demonstrated that adjunctive treatment with Bacillus clausii plus oral rehydration solution was associated with a greater reduction in loose stool frequency than racecadotril plus oral rehydration solution among children aged one to five years presenting with acute watery diarrhea and mild dehydration. The proportion of children achieving clinically meaningful reduction in stool frequency was higher in the Bacillus clausii group than in the racecadotril group, with response rates of 95.6% and 68.9%, respectively, corresponding to a relative risk of 1.39 and an absolute response advantage of 26.7 percentage points. Mean stool frequency also declined more markedly in the probiotic group at each follow-up point, with differences becoming more prominent at 48 and 72 hours. These findings suggest that modulation of intestinal microbial balance through Bacillus clausii may provide clinically relevant benefit when used as an adjunct to rehydration therapy in selected pediatric patients with acute watery diarrhea.

The observed benefit of Bacillus clausii is biologically plausible because probiotic organisms can support restoration of intestinal microbial equilibrium, enhance mucosal barrier function, inhibit pathogen adherence, and modulate local immune responses during diarrheal illness. Probiotics have been reported to improve clinical outcomes in childhood diarrhea by altering gut microbiota composition and attenuating inflammatory markers, while broader mechanistic work suggests that probiotic activity may involve competitive exclusion of pathogens, secretion of antimicrobial substances, immune regulation, and strengthening of epithelial barrier integrity (11,12). Bacillus clausii is particularly relevant in this context because its spore-forming structure permits survival through gastric acidity and persistence in the gastrointestinal tract after oral administration, allowing it to reach the intestine in a viable form and potentially contribute to recovery of microbial and epithelial function during acute diarrheal episodes (13).

The results are consistent with previous evidence suggesting that selected probiotics may reduce the duration and severity of pediatric diarrhea when added to standard therapy. Chen et al. reported improved recovery among hospitalized children receiving a combination probiotic preparation, with improvement defined by reduction in stool frequency and normalization of stool consistency within 24–48 hours (14). A systematic review and meta-analysis evaluating Bacillus clausii in children with acute diarrhea also reported reductions in diarrhea duration and hospitalization when Bacillus clausii was used with oral rehydration therapy, with or without zinc, although the authors noted heterogeneity across included trials (15). The present findings align with this probiotic-supportive evidence by showing a consistent reduction in stool frequency across overall and stratified analyses.

Racecadotril has also been supported in previous literature as an effective antisecretory adjunct in acute diarrhea because it reduces intestinal fluid and electrolyte secretion without suppressing intestinal motility. Earlier studies have reported that racecadotril can reduce stool output and shorten diarrhea duration when combined with oral rehydration therapy, and systematic evidence has suggested superiority over placebo or no adjunctive treatment in children with acute diarrhea (16,17). However, the present findings favored Bacillus clausii over racecadotril, indicating that in this study population, probiotic-mediated restoration of gut function may have produced a stronger clinical response than antisecretory reduction of fluid loss alone. This difference may reflect variation in patient age, illness duration, baseline disease characteristics, pathogen profile, timing of therapy initiation, or differences in supportive care.

The comparative literature between probiotics and racecadotril remains mixed. Some studies have reported better clinical effectiveness with racecadotril than probiotics, including higher rates of stool normalization and greater reduction in stool episodes during the first two days of treatment (18,19). Other pediatric studies have similarly shown shorter diarrhea duration and lower stool frequency with antisecretory therapy compared with probiotic treatment (20). In contrast, evidence from Quetta

reported greater improvement with probiotics than racecadotril, with higher stool improvement rates and shorter diarrhea duration among children receiving probiotic therapy (21). The present findings are closer to the latter pattern, suggesting that probiotic benefit may be more pronounced in certain clinical contexts. Differences in probiotic strain, dose, treatment timing, background use of oral rehydration and zinc, local enteric pathogen distribution, and endpoint definitions may explain the inconsistency across studies.

The stratified findings strengthen the clinical interpretation of the results because the advantage of Bacillus clausii was observed across age, sex, and symptom-duration categories. Among children aged 1–2 years, all patients in the probiotic group achieved reduction in stool frequency compared with 66.7% in the racecadotril group, while among children aged 3–5 years, response rates remained higher with Bacillus clausii at 91.7% versus 70.0%. Similar advantages were observed among male children, female children, those presenting before seven days of symptoms, and those presenting at or after seven days. The largest absolute response difference was seen among children presenting with symptoms for less than seven days, suggesting that earlier probiotic administration may be associated with greater clinical benefit. This finding is compatible with prior observations that children treated earlier during diarrheal episodes may derive greater benefit from probiotic therapy (7).

Although the study findings favor Bacillus clausii, they should be interpreted in relation to the broader evidence base, which does not uniformly support probiotic superiority. A randomized, double-blind, placebo-controlled study of Bacillus clausii combined with oral rehydration therapy and zinc found no significant difference in recovery time compared with placebo, with similar recovery proportions by 120 hours (22). This contrast may be related to mild-to-moderate illness severity, timing of treatment initiation, background zinc and rehydration therapy, and endpoint selection. Similarly, network meta-analytic evidence has suggested that racecadotril may be among the more effective adjuncts for acute diarrhea in children under five years of age (23). Therefore, while the present results support Bacillus clausii as an effective adjunct in this cohort, they also highlight the need to interpret treatment effects according to patient selection, clinical setting, and standardized outcome definitions.

The clinical importance of reducing stool frequency extends beyond symptomatic improvement. Frequent watery stools increase caregiver anxiety, fluid loss, risk of dehydration progression, and healthcare utilization. Oral rehydration therapy remains essential for preventing and treating dehydration, but it does not directly target stool frequency or illness duration. An adjunctive therapy that safely reduces stool burden may therefore improve clinical recovery, reduce caregiver workload, and potentially decrease the need for prolonged observation or hospitalization. In this study, the lower mean stool frequency at 24, 48, and 72 hours in the Bacillus clausii group suggests a sustained response over the early treatment period, which is particularly relevant for children with mild dehydration who require close monitoring to prevent clinical deterioration.

Several limitations should be considered when interpreting these findings. The allocation process was based on odd and even registration numbers, which may reduce allocation concealment compared with computer-generated randomization. Blinding was not described, and lack of blinding may influence caregiver reporting or clinical assessment of stool episodes. The study was conducted at a single center with a modest sample size, which may limit generalizability to other clinical settings. The analysis did not include pathogen-specific diagnosis, and treatment response may differ between viral, bacterial, and parasitic causes of diarrhea. Details regarding probiotic dose, racecadotril dosing schedule, zinc administration, adherence monitoring, feeding practices, and adverse events were not fully presented, and these factors may influence clinical outcomes. Baseline stool frequency was also central to the operational definition of response and should be clearly incorporated into interpretation of treatment effect.

Despite these limitations, the study provides useful comparative evidence for two commonly used adjunctive approaches in pediatric acute watery diarrhea. The consistent direction of effect across overall

and subgroup analyses supports the potential role of Bacillus clausii as an adjunct to oral rehydration therapy in children with mild dehydration. The findings contribute to the ongoing debate regarding probiotic versus antisecretory therapy by suggesting that, within this clinical population, Bacillus clausii may offer greater reduction in stool frequency than racecadotril. Future interpretation of these findings should be grounded in standardized reporting of baseline stool burden, treatment timing, dosing, co-interventions, adverse events, and clinically meaningful endpoints so that treatment effects can be compared more directly across pediatric diarrhea studies.

CONCLUSION

In children aged one to five years presenting with acute watery diarrhea and mild dehydration, adjunctive treatment with Bacillus clausii plus oral rehydration solution was associated with a greater reduction in loose stool frequency than racecadotril plus oral rehydration solution. Children receiving Bacillus clausii demonstrated higher rates of clinically meaningful stool-frequency reduction, lower mean stool frequency during follow-up, and consistent benefit across age, sex, and symptom-duration subgroups. These findings support Bacillus clausii as an effective adjunctive treatment option for reducing stool burden in pediatric acute watery diarrhea when used alongside standard oral rehydration therapy.

REFERENCES

1. Lai HH, Chiu CH, Kong MS, Chang CJ, Chen CC. Probiotic Lactobacillus casei: effective for managing childhood diarrhea by altering gut microbiota and attenuating fecal inflammatory markers. Nutrients. 2019;11(5):1-15.

2. Senderovich H, Vierhout M. Is there a role for bismuth in diarrhea management? Rambam Maimonides Med J. 2021;12(1):1-12.

3. Alam S, Bhatnagar S. Current status of anti-diarrheal and anti-secretory drugs in the management of acute childhood diarrhea. Indian J Pediatr. 2006;73(8):693-696.

4. Guarino A, Lo Vecchio A, Dias JA, Berkley JA, Boey C, Bruzzese D, et al. Universal recommendations for the management of acute diarrhea in nonmalnourished children. J Pediatr Gastroenterol Nutr. 2018;67(5):586-593.

5. Wolvers D, Antoine JM, Myllyluoma E, Schrezenmeir J, Szajewska H, Rijkers GT. Guidance for substantiating the evidence for beneficial effects of probiotics: prevention and management of infections by probiotics. J Nutr. 2010;140(3):698S-712S.

6. Ishaque SM, Khosruzzaman SM, Ahmed DS, Sah MP. A randomized placebo-controlled clinical trial of a multi-strain probiotic formulation (Bio-Kult®) in the management of diarrhea-predominant irritable bowel syndrome. BMC Gastroenterol. 2018;18(1):1-12.

7. Rosenfeldt V, Michaelsen KF, Jakobsen M, Larsen CN, Møller PL, Pedersen P, et al. Effect of probiotic Lactobacillus strains in young children hospitalized with acute diarrhea. Pediatr Infect Dis J. 2002;21(5):411-416.

8. Applegate JA, Fischer Walker CL, Ambikapathi R, Black RE. Systematic review of probiotics for the treatment of community-acquired acute diarrhea in children. BMC Public Health. 2013;13 Suppl 3:S16.

9. Chen K, Xin J, Zhang G, Xie H, Luo L, Yuan S, et al. A combination of three probiotic strains for treatment of acute diarrhoea in hospitalised children: an open label, randomised controlled trial. Benef Microbes. 2020;11(4):339-346.

10. Quigley EM. Prebiotics and probiotics: their role in the management of gastrointestinal disorders in adults. Nutr Clin Pract. 2012;27(2):195-200.

11. De Leon RCV, Chiu HHC, De Castro KPB, Velasquez JRH, Dans AML. Racecadotril (acetorphan) for diarrhea in adults infected with HIV/AIDS: a meta-analysis and systematic review. Acta Med Philipp. 2020;54(3):1-7.

12. Zaman S, Aamir K, Hanson L, Lange S. High doses of antisecretory factor stop diarrhea fast without recurrence for six weeks post treatment. Int J Infect Dis. 2018;71:48-52.

13. Sultana A, Bishwas P, Islam S, Ghosh UK, Iman K, Afroze S, et al. Role of racecadotril in children with acute diarrhea. Dhaka Shishu Hosp J. 2020;36(1):8-13.

14. Troeger C, Blacker BF, Khalil IA, Rao PC, Cao S, Zimsen SR, et al. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of diarrhoea in 195 countries: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Infect Dis. 2018;18(11):1211-1228.

15. Ianiro G, Rizzatti G, Plomer M, Lopetuso L, Scaldaferri F, Franceschi F, et al. Bacillus clausii for the treatment of acute diarrhea in children: a systematic review and meta-analysis of randomized controlled trials. Nutrients. 2018;10(8):1074

16. Million Death Study Collaborators. Causes of neonatal and child mortality in India: a nationally representative mortality survey. Lancet. 2010;376(9755):1853-1860.

17. Bermudez-Brito M, Plaza-Díaz J, Muñoz-Quezada S, Gómez-Llorente C, Gil A. Probiotic mechanisms of action. Ann Nutr Metab. 2012;61(2):160-174.

18. Ghelardi E, Celandroni F, Salvetti S, Gueye S, Lupetti A, Senesi S. Survival and persistence of Bacillus clausii in the human gastrointestinal tract following oral administration as spore-based probiotic formulation. J Appl Microbiol. 2015;119(2):552-559.

19. Burns PB, Rohrich RJ, Chung KC. The levels of evidence and their role in evidence-based medicine. Plast Reconstr Surg. 2011;128(1):305-310.

20. Wali A, Aslam MN, Hussain S. Evaluate the racecadotril efficacy in contrast the treatment of acute diarrhea with tril compared to probiotics and loperamide in adults. Pak J Med Health Sci. 2022;16(8):719.

21. Ahmad Z, Pervez S, Alam NE, Mohammad J, Rahman A, Hussain S, et al. Comparison of efficacy of racecadotril versus probiotics in the treatment of children with acute watery diarrhoea. Int J Health Res. 2025;3(2):303-309.

22. Asghar L, Usman M, Gul R, Tahir A, Bashir MU, Hussain I. Role of probiotic and racecadotril as an adjuvant therapy in management of acute watery diarrhea in children. Shaheed Zulfiqar Ali Bhutto Med Univ J. 2025;21(2):424-429.