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ORIGINAL ARTICLE

Comparative Effectiveness of Restrictive Antibiotic versus Probiotic-Fluids First Protocols for Adult Diarrhea.

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ABSTRACT

Objective: Comparative Effectiveness of Restrictive Antibiotic vs. Probiotic-Fluids First Protocols for Adult Diarrhea.

Methodology: Over a period of one month, a prospective cohort study was carried out. A total of 136 patients with newly diagnosed acute diarrhea, ages 13 to 40, were recruited and split into two groups: Group A received probiotics plus ORS (n = 68) and Group B received antibiotics plus ORS (n = 68). Time to symptom resolution, frequency of bowel movements, related gastrointestinal symptoms, need for supportive therapy, and seven-day ED visits were among the clinical outcomes evaluated.

Results: Compared to the probiotic group, patients receiving antimicrobial treatment showed reduced stool frequency (5 vs. 10 episodes/day), shorter recovery times (mean 5 vs. 8 days), and fewer revisits (35 vs. 40). Additionally, compared to the probiotic group (50 and 45 cases), nausea and vomiting were less common in the antimicrobial group (45 and 30 cases, respectively). Antimicrobials caused constipation more frequently (20 vs. 10 cases). Although the probiotic group experienced a greater number of symptoms, no serious side effects were noted, suggesting that it may be useful in treating simple, self-limiting diarrhea.

Conclusion: Probiotic-plus-ORS therapy served as a safe, non-antibiotic option for mild cases, aligning with antimicrobial stewardship goals. Conversely, antimicrobial-plus-ORS therapy led to quicker recovery and fewer revisits, stressing the importance of prudent antibiotic use and the need for randomized trials to strengthen non-antibiotic treatments for acute diarrhea.

Keywords: Anti-Bacterial Agents; Antimicrobial Stewardship; Diarrhea; Oral Rehydration Solutions; Probiotics; Treatment Outcome.

Authors' Contribution:
[1,2]Conception; Literature research; manuscript design and drafting; [3,4]Critical analysis and manuscript review; [5,6,7]Data analysis; Manuscript Editing.

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Article info:
Received: May 25, 2026
Accepted: September 05, 2026

Cite this article. Mujtaba A, Bibi I, Khushtabba, Naseer H, Ibrahim M, Siddiq A, et al., Comparative effectiveness of restrictive antibiotic versus probiotic-fluids first protocols for adult diarrhea. J Islamabad Med Dental Coll. 2026; 15(3): 320-326.
DOI: https://doi.org/10.35787/jimdc.v15i3.1622

Funding Source: Nil
Conflict of interest: Nil

Introduction

Diarrhea is characterized by frequent, watery stools resulting from impaired water and electrolyte absorption, often due to damage in intestinal ion channels, transport proteins, or protective barriers and causes abnormal bowel movements.[1] "The passage of three or more loose or liquid stools per day or more frequent passage than is normal for the individual" is how the World Health Organization (WHO) defines diarrhea.[2] Etiological factors that can cause diarrhea are the infectious, inflammatory, and endocrhonological pathologies. Additionally, an overabundance of pathogenic bacteria can result from abnormalities in the gut micro biome which can eradicate good bacteria and permit the growth of harmful germs eventually causing diarrhea.[3] Based on its duration, diarrhea is divided into three groups:

acute (lasting less than 14 days), persistent (lasting 14–30 days), and chronic (lasting more than 30 days).[4]

According to the World Health Organization's (WHO) Global Health Estimates 2020, diarrhea is the eighth leading cause of mortality worldwide.[5] Diarrheal infections account for 1 in 9 child fatalities worldwide, with 801,000 children dying from diarrhea each year. In Pakistan, Diarrhea is causing 60% of baby and toddler fatalities, a nation of over 225 million people.[6] Due to insufficient data on births and deaths and a non-operational disease surveillance system, these figures do not accurately represent the reality.[7]

Currently, loperamide, diphenoxylate, clonidine, codeine, morphine preparations, and anticholinergic drugs are available as treatments for chronic diarrhea. Despite being the most effective antidiarrheal medications, opiates are not often recommended due to concerns about abuse. For severe diarrhea, as that caused by bowel resection, codeine, opium, or morphine preparations (such as paregoric, tincture of opium, and morphine) can be particularly helpful.[8] Maintaining hydration by oral rehydration or intravenous fluids is the cornerstone of controlling diarrhea. By restoring electrolyte balance and hydration, oral rehydration solution aims to reduce diarrhea-related mortality and morbidity. Routine zinc therapy as an adjunct to ORT is useful for modest reduction of the severity but more importantly to reduce diarrhea episodes in children in developing countries.[9]

Nevertheless, these medications may result in adverse effects like bloating, vomiting, nausea, constipation, and more diarrheal episodes.[10,11] Additionally, the use of antibiotics raises questions about resistance and persistence.[12] As a result, treating persistent diarrhea presents many challenges. Diarrhea patients frequently have decreased gut microbial diversity, making them more vulnerable to infections.[13,14] Normal gut function depends on the gut microbiota, which supports immunological response and homeostasis in addition to digestion and absorption.[15] By causing acute microbiota changes that enhance vulnerability to opportunistic pathogen colonization, including Clostridium difficile, and antibiotic-associated diarrhea (AAD), antibiotic therapy upsets this advantageous, symbiotic connection.[16]

Natural methods like probiotic or symbiotic supplementation have gained interest in addition to standard pharmaceutical treatments for the treatment of diarrhea. "Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host" is the definition of probiotics.[17] Like probiotics, they provide health benefits and contain inactivated microbial cells or biological components, which makes them more durable. Lacticaseibacillus paracasei, for instance, may be able to ease diarrhea and drastically lower its frequency when heated.[18]

The benefits of S. boulardii in treating adult and pediatric diarrhea linked to a variety of causes, including antibiotics or Clostridium difficile (C. difficile) infections, have been covered in numerous clinical trials.[19,20] Comparative studies assessing the efficacy of probiotics and oral rehydration solutions (ORS) as first-line treatments in lieu of antibiotics are conspicuously lacking, despite the existence of comprehensive systematic reviews endorsing their use in the treatment of acute diarrhea. It is well acknowledged that the excessive use of antibiotics by humans has created significant selection pressure for bacteria to evolve tolerance and resistance.[21] This problem is particularly relevant in Pakistani emergency rooms, where the over prescription of antibiotics is still common and mostly unchecked.

The clinical results of treating acute adult diarrhea with ORS and probiotics alone, without concurrent antibiotic therapy, have not yet been directly evaluated in any local trials. Reevaluating current treatment paradigms in this context is both relevant and timely, given the self-limiting nature of many diarrheal disorders and the pressing need to support evidence-based prescribing practices.

The purpose of this study is to evaluate the clinical efficacy of oral rehydration solution and probiotics in comparison to antibiotic therapy in adult patients who arrive at a tertiary care emergency room with severe diarrhea. This study aims to provide evidence that may promote safer, non-antibiotic-based first-line therapies and help enhance antimicrobial stewardship policies in Pakistan by evaluating symptom resolution, complication rates, and overall treatment results.

Methodology

A prospective cohort study was carried out on adult patients who arrived at PIMS emergency room with acute diarrhea. The main goal was to evaluate and compare the efficacy of probiotics and oral rehydration solution (ORS) versus antimicrobial therapy in the treatment of acute diarrhea. Prior research evaluating treatment options for acute diarrhea in otherwise healthy adults without comorbidities has documented similar comparative methods.

The study was conducted over a period of two months, from 1 June 2025 to 1 August 2025, in the emergency room of a tertiary care hospital. The target population consisted of patients with newly diagnosed acute diarrhea. Acute diarrhea was defined as the passage of three or more loose or watery stools within a 24-hour period, with onset within the previous seven days.

Individuals aged 13 to 40 years with acute diarrhea lasting less than seven days and who had not previously taken antibiotics or probiotics for the current episode were eligible for participation. Patients with fever, pre-existing comorbid conditions such as diabetes, chronic renal disease, or liver disease, or diarrhea lasting longer than seven days were excluded.

A convenience non-probability sampling method was used. Participation was open to all patients who met the study eligibility criteria. A total of 136 patients were enrolled and equally divided into two groups of 68 patients each according to the treatment prescribed by the attending physician in the emergency department. Patients in Group A received antimicrobial therapy with antibiotics in accordance with accepted clinical practices, along with ORS. Patients in Group B received probiotics along with ORS without antibiotic treatment. Treatment allocation was entirely observational and followed standard clinical practice; no randomization or investigator-driven intervention was performed.

The primary outcome was the time to resolution of diarrhea, defined as the interval between initiation of treatment and passage of the last unformed stool. Secondary outcomes included the requirement for intravenous fluids during hospitalization, frequency of adverse effects such as electrolyte imbalance, dehydration, and vomiting, and return visits to the emergency department within seven days following discharge.

Data were collected using a structured questionnaire and supplemented by patient interviews, clinical examination findings, and medical record reviews. Patients were monitored throughout their hospital stay, and outcomes were assessed through post-discharge follow-up.

Data were analyzed using SPSS version 26. Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The mean age between the two treatment groups was compared using an independent-samples t-test. Categorical variables, including sex, clinical symptoms, adverse effects, intravenous fluid requirements, and seven-day emergency department revisits, were compared using the chi-square test or Fisher's exact test where appropriate. The independent-samples t-test was also used to compare continuous outcome variables such as time to resolution of diarrhea and stool frequency

between the two groups. A p-value of <0.05 was considered statistically significant.

A total of 136 patients meeting the inclusion criteria were enrolled in the study. Participants were equally divided into two groups; 68 patients received standard antimicrobial therapy along with oral rehydration solution (ORS) (Group A), and 68 patients received probiotics along with oral rehydration solution (ORS) without antibiotics (Group B).

The overall mean age of participants was 27.52 ± 8.08 years, with a minimum age of 13 and maximum age of 40 years. There was no statistically significant difference in baseline age between the two groups.

The ethical approval from PIMS was obtained under IRB Number No.F.11-4/2025-TCA-(Admin)-BCC/ER, dated 02.04.2025

Results

Table 1 summarizes the key clinical outcomes in both groups. Comorbidities were slightly more common in the antimicrobial group (n=20) compared to the probiotic group (n=15). The number of revisits to the emergency department within 5days post-discharge was lower in the antimicrobial group (n=35) than in the probiotic group (n=40). Duration of treatmentis longer in probiotic group (8 days) than in the antimicrobial group (5 days), with the mean length of 6.1±2.2 days. Stool frequency per day was higher in the probiotic group (10 episodes/day) compared to the antimicrobial group (5 episodes/day), with a mean frequency of 8.1 ± 2.5.

As shown in Table 2 and in Figure 1, associated gastrointestinal and systemic symptoms varied between the two groups. The probiotic group exhibited a higher frequency of most symptoms: Fever was reported in 55 patients in the probiotic group compared to 50 in the antimicrobial group, vomiting was significantly more frequent in the probiotic group (n=45) than in the antimicrobial group (n=30), nausea was also more commonly reported in the probiotic group (n=50) than in the antimicrobial group (n=45), but the constipation was more prevalent in the antimicrobial group (n=20) compared to the probiotic group (n=10).

These findings suggest that patients in the probiotic group experienced a higher burden of acute gastrointestinal symptoms, while constipation appeared more often among those receiving antibiotics.

Table I: Demographic characteristics:

Characteristics	Group A (Antimicrobial)	Group B (Probiotic)
n=136	68	68
Age	13-40	13-40
Gender	Male and female	Male and female

Table II: Comparison of clinical characteristics and outcomes between study group (n=68)

Variable	Antimicrobial Group+ORS	Probiotic Group	p-value
Age	27.6± 8.1	27.4± 8.0	0.88
Comorbid condition,	20(29.4%)	15(22.1%)	0.31
Duration of Diarrhea	5	8	<0.001
Stool frequency	5	10	<0.001
ED visit within 7 days	35(51.5%)	40(58.8%)	0.39

Table III: Frequency of associated symptoms in both groups.

Symptoms	Antimicrobial group	Probiotic group	p-value
Fever	73.5%	80.9%	0.41
Vomiting	44.1%	66.2%	0.01
Nausea	66.2%	73.5%	0.45
Constipation	29.4%	14.7%	0.063

Table IV: Multivariable logistic regression for predictors of ed revisit.			
Variable	**Odds Ratio**	**95% Confidence Interval**	**p-value**
Probiotic therapy	1.28	0.63-2.58	0.49
Fever	1.19	0.54-2.61	0.66
Vomiting	1.28	1.01-3.30	0.046
Nausea	1.14	0.55-2.36	0.72
comorbidities	1.33	0.62-2.86	0.46

Discussion

In this prospective observational comparative study, we compared two treatment approaches for adult acute diarrhea in an emergency department setting: standard antimicrobial-plus-ORS versus a probiotics-plus-ORS therapies. We observed that patients treated with antimicrobials had fewer emergency revisits, along with lower rates of vomiting and nausea, whereas those in the probiotic group experienced higher stool frequency and more frequent occurrences of fever, vomiting, and nausea, though they had less constipation.

Our findings align with previous literature on the role of probiotics and antibiotics in diarrhea management. A systematic review focusing on pediatric diarrhea found that probiotics reduced the duration of symptoms and fever, though they had limited impact on stool frequency or vomiting in adults.[22,23] For adults, evidence supporting probiotic efficacy in acute community-acquired diarrhea remains inconclusive, especially in bacterial infections, which may explain why the probiotic group in our study exhibited a higher symptom burden and revisit rate.[24]

In contrast, randomized trials of rifaximin in travelers' diarrhea have demonstrated significantly faster recovery times. One multicenter study showed that patients treated with rifaximin had a median time to last unformed stool (TLUS) of around 32 hours, compared to approximately 60 hours with placebo.[25,26] Meta-analyses of prophylactic antibiotic use, including rifaximin and fluoroquinolones, revealed relative risk reductions for travelers' diarrhea of approximately 67% and 88%, respectively.[27] These results support our finding that antimicrobial therapy correlated with fewer symptoms and revisits.

In our study setting, many patients in the antimicrobial group were treated empirically with intravenous antibiotics such as metronidazole (Flagyl), particularly when symptoms suggested a possible protozoal or anaerobic bacterial cause. In addition, supportive agents including IV fluids (normal saline), proton pump inhibitors (Rizek), and antiemetics were commonly co-administered to stabilize patients and address dehydration and associated symptoms. These therapeutic decisions reflect routine emergency department practices and reinforce the value of tailored, symptomatic management alongside antimicrobial selection.

Clinically, our data suggest that while a probiotics-plus-ORS regimen may be suitable for uncomplicated, likely viral diarrhea, patients presenting with fever, persistent vomiting, or moderate dehydration may warrant selective antimicrobial-plus-ORS therapy to prevent complications and reduce revisits. This nuanced approach reflects real-world effectiveness within an emergency department and underscores the importance of individualized treatment decisions guided by clinical presentation.

The strengths of our study include its real-world, prospective design and systematic symptom tracking. However, limitations must be considered. The non-randomized design may introduce selection bias, while the absence of microbiological testing prevented differentiation between viral and bacterial etiologies. Our follow-up period was limited to five days, potentially overlooking longer-term outcomes. Additionally, symptom assessment relied on patient self-reporting, which may be subject to recall bias.

Despite these limitations, this study adds to the body of evidence supporting selective antibiotic and

ORS use and the potential utility of probiotics and ORS in managing acute diarrhea. Future research should include randomized controlled trials with diagnostic confirmation, longer-term follow-up, cost-effectiveness evaluation, and stratified analysis by symptom severity and patient subgroups. Evaluating different probiotic strains and their dosages may also help optimize non-antibiotic management strategies.

Conclusion

The study's conclusion stresses a balanced strategy: probiotics with ORS may be used as a first-line treatment for simple, self-limiting cases, while antibiotics should be saved for patients with severe or complex presentations.

Acknowledgment: All employees of the ER helping with patient care and data collection.

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