



Role of Multi Strain Probiotics Recurrent Respiratory Tract Infections

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ABSTRACT

Background: Pakistan continues to experience a high burden of respiratory tract infections. Unfortunately, research on interventions to minimize RRTIs is scarce, and no definitive strategies have been developed. Probiotics have shown promise in supporting gut health and immune function in young children, according to various clinical studies. However, their potential to prevent or reduce the recurrence of RRTIs is not well-established. Therefore, I intend to undertake this study to assess whether probiotics can be used as a practical approach to reduce the frequency of RRTIs. **Objectives:** To determine efficacy of role of multi strain probiotics in recurrent respiratory tract infection. **Methodology:** This study was conducted at the Department of Pediatrics, Allied Hospital, Faisalabad, Pakistan, during the period of one year, from April, 2024 to April, 2025 and enrolled 95 children meeting the operational criteria for RRTIs. All received a 14-days course of Ecotec® probiotics containing *Lactobacillus acidophilus* LA-5, *Bifidobacterium* BB-12, *Streptococcus thermophilus* STY-31, and *Lactobacillus delbrueckii subsp. bulgaricus* LBY-27. Participants were followed for six months to assess recurrence. Stratified chi-square analysis was performed. **Results:** The majority (85.3%) of participants were aged under five. Overall, 56 children (58.9%) showed no recurrence of RRTIs. Breastfeeding showed a significant association with effectiveness ($p = 0.048$), while age, gender, immunization, nutritional status, and type of infection did not show significant associations ($p > 0.05$). No adverse effects were reported **Conclusion:** Short-term administration of multi-strain probiotics effectively reduced the recurrence of respiratory infections in children, particularly among breastfed individuals. These findings support the use of probiotics as a safe, beneficial adjunct in pediatric respiratory infection management.

INTRODUCTION

Among the most frequently occurring infections, Respiratory Tract Infections (RTI) result from viral or bacterial pathogens and are classified as either upper or Lower Respiratory Tract (LRT) infections.¹⁻³ Structures such as the nose, sinuses, pharynx, and larynx make up the upper respiratory tract. Common infections in this area include the common cold, tonsillitis, laryngitis, pharyngitis, sinusitis, otitis media, and certain strains of influenza. These infections usually present with symptoms like sore throat, sneezing, nasal congestion, cough, headache, low-grade fever, and pressure in the facial region.⁴⁻⁵ Comprising the trachea, bronchioles, bronchial tubes, and lungs, the lower respiratory tract is associated with infections that are generally more serious and clinically important than upper respiratory tract infections.⁶⁻⁹

Children of all ages around the world continue to be significantly affected by respiratory tract infections, which are among the top causes of mortality and morbidity. In their first year, many children under two experience

multiple RTIs, and roughly one-quarter in developed regions endure ongoing or recurrent illness.¹⁰ In developing nations such as Pakistan, respiratory tract infections particularly pneumonia remain a major cause of death among children under five. Worldwide, acute respiratory infections, mainly pneumonia, are responsible for about 20% of all deaths in this age group. According to WHO statistics, pneumonia accounts for 11.5% of under-five mortality in Pakistan.¹¹

Recurrent respiratory tract infections are frequently observed in early childhood, largely because infants and young children possess an immune system that has not yet adapted to common environmental pathogens. Studies have shown that 25% of infants and 6% of children under six years suffer from RRTIs.¹² In recent years, immunotherapy, which involves strategies aimed at enhancing or modulating specific immune system components to strengthen host defenses—has gained attention. Additionally, various approaches such as the use of vitamins, probiotics, trace elements, and complementary or alternative medicine have also been

explored.¹³

Live microorganisms known as probiotics, when administered adequately, are believed to confer health benefits to the host. Their presumed ability to prevent infections by adhering to the mucosal lining of the gut is not clearly linked to respiratory tract infection prevention. Although immune modulation has been proposed as a mechanism, Garaiova et al. found no significant cytokine response to support this. In a group of 70 children treated with multistrain probiotics, 41.4% (29 children) experienced recurrence of RRTIs within six months.¹¹ Pakistan continues to experience a high burden of respiratory tract infections. Unfortunately, research on interventions to minimize RRTIs is scarce, and no definitive strategies have been developed. Probiotics have shown promise in supporting gut health and immune function in young children, according to various clinical studies. However, their potential to prevent or reduce the recurrence of RRTIs is not well-established. Therefore, I intend to undertake this study to assess whether probiotics can be used as a practical approach to reduce the frequency of RRTIs.

MATERIALS AND METHODS

This descriptive study was carried out in the Department of Pediatrics, Allied Hospital, Faisalabad, over a duration of twelve months from April, 2024 to April, 2025, following approval from the Institutional Ethical Review Committee. The purpose of the study was to evaluate the efficacy of multi-strain probiotics in preventing recurrent respiratory tract infections in children. A sample size of 95 patients was determined using the WHO sample size calculator, with an assumed prevalence of recurrent respiratory tract infections at 41.4%, a 95% confidence level, and a 10% absolute precision. Patients were selected through non-probability consecutive sampling.

Children aged 6 months to 12 years of either gender who met the criteria for recurrent respiratory tract infections were included. Recurrent respiratory tract infections were defined as either pharyngotonsillitis (more than three episodes in 12 months, characterized by fever, cough, tonsillar redness and swelling, runny nose, rash, or abdominal symptoms) or pneumonia (two or more radiologically confirmed episodes within one year or three or more episodes over a lifetime with normal radiographic findings between episodes). Children with chronic respiratory diseases such as cystic fibrosis or ciliary dyskinesia, those with immunodeficiency, those receiving probiotics for other medical conditions such as inflammatory bowel disease, and those who had received the influenza vaccine were excluded.

Following written informed consent from parents or guardians, eligible children were enrolled in the study. Each child received one daily sachet of a multistrain probiotic (Ecotec®, SEARLE, Pakistan) for 14 days. The formulation contained over 2 billion CFU, including *Lactobacillus acidophilus* LA-5, *Bifidobacterium* BB-12, *Streptococcus thermophilus* STY-31, and *Lactobacillus delbrueckii* subsp. *bulgaricus* LBY-27. Participants were monitored for six months to evaluate the recurrence of respiratory tract infections.

Follow-up was maintained via telephonic contact, and

recurrence was assessed through physical examination and clinical evaluation by a consultant pediatrician based on operational definitions. When indicated, chest X-rays were obtained from the hospital's radiology department and interpreted by a radiologist. All data were recorded using a structured proforma.

Data were entered and analyzed using SPSS version 25. Mean and standard deviation were calculated for quantitative variables such as age. Frequencies and percentages were computed for qualitative variables including gender, immunization status, breastfeeding status, nutritional status, type of respiratory tract infection, and treatment efficacy. To control for effect modifiers, stratification was performed for age, gender, immunization status, breastfeeding, nutritional status, and infection type.

RESULTS

The study population predominantly comprised children between the ages of 0 to 5 years, making up 85.3% of the total sample, while 14.7% were aged 6 to 12 years. Gender distribution was nearly equal, with 51.6% males and 48.4% females. Most children (72.6%) had completed their immunization schedule. Additionally, a majority had a history of breastfeeding (80.0%) and were classified as nutritionally normal (65.3%). In terms of clinical characteristics, pharyngotonsillitis was more frequently reported (69.5%) than pneumonia (30.5%). Regarding treatment efficacy, 56 out of 95 children (58.9%) experienced no recurrence of respiratory tract infection within six months of probiotic therapy, indicating a favorable response, while 41.1% experienced recurrence. When the efficacy was analyzed across different subgroups, no statistically significant differences were observed for age ($p = .660$), gender ($p = .641$), immunization status ($p = .753$), nutritional status ($p = .811$), or type of RTI ($p = .682$). However, breastfeeding status showed a significant association with treatment success ($p = .048$). Children who had been breastfed showed a notably higher rate of effectiveness (73.2%) compared to those who were not breastfed (26.8%). This suggests that breastfeeding may enhance the immunomodulatory effects of probiotics in preventing recurrent RTIs.

Table 1

Demographic and Health Characteristics

Variable	Group	Count	Percent
Age (years)	0-5 years	81	85.3%
	6-12 years	14	14.7%
Gender	Male	49	51.6%
	Female	46	48.4%
Immunization Status	Complete	69	72.6%
	Incomplete	26	27.4%

Table 2

Feeding and Nutritional Characteristics

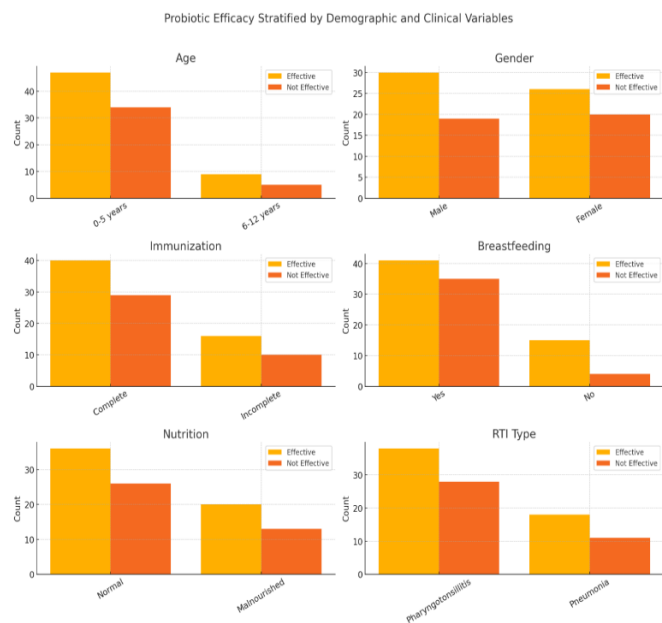
Variable	Group	Count	Percent
Breast Feeding	Yes	76	80.0%
	No	19	20.0%
Nutritional Status	Normal	62	65.3%
	Malnourished	33	34.7%

Table 3
Clinical Characteristics and Outcome

Variable	Group	Count	Percent
Type of RTI	Pharyngotonsillitis	66	69.5%
	Pneumonia	29	30.5%
Efficacy	Yes	56	58.9%
	No	39	41.1%

Table 4
Stratified Analysis of Probiotic Efficacy across Demographic and Clinical Subgroups

Variable	Group	Effective (Count %)	Not Effective (Count %)	Total (Count %)	P-value
Age (years)	0-5 years	47 (83.9%)	34 (87.2%)	81 (85.3%)	.660
	6-12 years	9 (16.1%)	5 (12.8%)	14 (14.7%)	
Gender	Male	30 (53.6%)	19 (48.7%)	49 (51.6%)	.641
	Females	26 (46.4%)	20 (51.3%)	46 (48.4%)	
Immunization Status	Complete	40 (71.4%)	29 (74.4%)	69 (72.6%)	.753
	Incomplete	16 (28.6%)	10 (25.6%)	26 (27.4%)	
Breast Feeding	Yes	41 (73.2%)	35 (89.7%)	76 (80.0%)	.048
	No	15 (26.8%)	4 (10.3%)	19 (20.0%)	
Nutritional Status	Normal	36 (64.3%)	26 (66.7%)	62 (65.3%)	.811
	Malnourished	20 (35.7%)	13 (33.3%)	33 (34.7%)	
Type of RTI	Pharyngotonsillitis	38 (67.9%)	28 (71.8%)	66 (69.5%)	.682
	Pneumonia	18 (32.1%)	11 (28.2%)	29 (30.5%)	

Figure 1

DISCUSSION

In various developing countries like Pakistan, recurrent respiratory tract infections significantly impact child health. Our findings demonstrated that 58.9% of children aged 6 months to 12 years did not experience RRTI recurrence for six months following a two-week course of a multistrain probiotic. This emphasizes the potential of probiotics in reducing respiratory infection recurrence in children.

Our results align with those of Khan Laghari et al¹⁴ who conducted a quasi-experimental study involving 70 children with RRTIs. They reported a significant decrease in the recurrence of specific infections: infectious rhinitis

($p = 0.02$), otitis media ($p = 0.03$), and bronchiolitis ($p = 0.05$) over a six-month follow-up period after administering probiotics containing *Bifidobacterium* and *Lactobacillus acidophilus* for two weeks.

Similarly, Khanna Pulmami and Yendamuri¹⁵ conducted a randomized, double-blind, placebo-controlled study with 400 children aged 3–6 years. They found that daily supplementation with probiotics (*Lactobacillus acidophilus* and *Bifidobacterium lactis*) over six months significantly reduced the duration of RTI symptoms compared to the placebo group.

In our study, breastfeeding emerged as a significant factor associated with reduced recurrence of RRTIs. Among children who did not experience recurrence, 73.2% had a history of breastfeeding ($p = 0.048$). This finding is consistent with the study by Farrukh et al¹⁶ who reported higher breastfeeding rates in the probiotic group (83.8%) compared to the placebo group (67.6%). They also noted that multi-strain probiotic therapy significantly reduced the duration of rales among children with upper respiratory tract infections.

The immunomodulatory effects of probiotics have been highlighted in various studies. The study by Akhtiar et al. showed that multistrain probiotics are effective in reducing how often and how severely URTIs occur, as well as shortening their duration. They were also found to enhance immune performance and quality of life, with negligible side effects. These results indicate that multistrain probiotics could be a valuable complementary approach in preventing and alleviating URTIs, especially among those with frequent infections.¹⁷

A randomized clinical study by Bettocchi et al.¹⁸ investigated the use of a probiotic blend comprising *Bifidobacterium breve*, *Bifidobacterium lactis*, and *Lactobacillus rhamnosus* in pediatric URTI cases. The median fever duration was significantly reduced to 3 days in the probiotic group, compared to 5 days in those receiving placebo, with an adjusted risk ratio of 0.64 (95% CI: 0.51–0.80). The incidence of mild adverse events did not differ between groups, indicating the treatment was well tolerated. While our study did not find statistically significant associations between probiotic efficacy and variables such as age, gender, immunization status, nutritional status, or type of RTI, the overall findings support the beneficial role of probiotics in reducing the recurrence of respiratory infections in children.

Our study has several limitations. The sample size, though calculated appropriately, may limit the generalizability of the findings. The short duration of probiotic administration (14 days) may not reflect the optimal duration required for sustained immunomodulatory effects. Additionally, the lack of laboratory assessments, such as cytokine profiling, limits the ability to elucidate the precise immunological mechanisms underlying the observed clinical benefits.

Future studies should consider larger, multicenter randomized controlled trials with extended probiotic administration periods. Incorporating immunological assessments, such as cytokine levels and microbiota analyses, would provide deeper insights into the mechanisms by which probiotics confer protection against RRTIs. Moreover, evaluating the cost-effectiveness of

probiotic supplementation could inform public health strategies, especially in resource-limited settings.

CONCLUSION

Our study demonstrates that short-term administration of multi-strain probiotics can significantly reduce the

recurrence of respiratory tract infections in children, particularly among those who have been breastfed. These findings, corroborated by multiple studies, highlight the potential of probiotics as a safe and effective adjunctive strategy in the prevention of RRTIs in pediatric populations.

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