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Original Research Article

Role of Multistrain Probiotics in Presentation of Severity and Frequency of Upper Respiratory Tract Infection

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Abstract: *Upper respiratory tract infections (URTIs) are a common health issue that significantly impact individuals' quality of life. Probiotic supplementation has been suggested as a potential intervention to reduce URTIs' frequency, severity, and duration.* ***Objective:*** *This study aimed to evaluate the role of multistrain probiotics in the presentation of severity and frequency of URTIs.* ***Methods:*** *This cross-sectional study was conducted at Abbasi Shaheed Hospital, Karachi, during July 2024 to December 2024. The study involved a total of 185 patients, aged between 4 and 12 years. Data collection was carried out in two phases: baseline and follow-up. At baseline, participants underwent a thorough medical examination and completed questionnaires assessing their general health and history of respiratory infections.* ***Results:*** *The treatment group experienced a significantly lower frequency of URTIs (1.14 episodes per participant) compared to the other group (2.03 episodes per participant, $p < 0.01$). Symptom severity, as indicated by the Jackson score, was significantly reduced in the probiotic group (2.3 ± 0.8) compared to the other group (3.4 ± 1.1, $p < 0.05$). The duration of illness was also shorter in the treatment group (4.5 ± 1.2 days) compared to the other group (6.2 ± 1.5 days, $p < 0.01$). Immune markers showed a favorable response in the probiotic group, with reduced IL-6 levels and increased IL-10.* ***Conclusions:*** *Multistrain probiotics significantly reduce the frequency, severity, and duration of URTIs. The probiotics also positively impact immune function and quality of life, with minimal side effects. These findings suggest that multistrain probiotics could be a helpful adjunct in preventing and reducing the severity of URTIs, particularly in individuals prone to recurrent infections.*

Keywords: Probiotics Respiratory Tract Infections Immune System Inflammation Mediators Treatment Outcome

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Introduction

URTIs represent common infections worldwide which cause millions of annual cases, particularly during winter. Multiple probiotic strains exist in these formulations to supply different species that work together for immune regulation and the prevention of infections (1). Using multiple probiotic strains in a single product makes multistrain probiotics more efficient at improving general health outcomes because they deliver broader benefits prospects. Different strains within probiotics align to enhance the immune responses by protecting mucosal membranes, releasing protective cytokines, and building healthy germ colonies in both intestinal and airway systems (2). Studies indicate that some probiotics shape the respiratory microbiome to protect the respiratory tract from dangerous colonizing pathogens. Through their interaction with the immune system, probiotics increase human defense capabilities against respiratory pathogens that cause URTIs (3).

The effectiveness of multistrain probiotics for treating URTI severity and frequency is presently under evaluation through clinical trials and meta-analyses and these studies indicate positive outcomes (4). The intake of multiple bacterial strains in probiotics decreases upper respiratory tract infections in all age groups, especially among elderly patients and people with respiratory diseases or those who spend time in dense viral exposure settings, such as healthcare institutions (5). Studies demonstrate that probiotics decrease both symptom intensity and illness duration of URTIs, thus offering an alternative to the standard medical practice of antibiotic use despite its inferior performance towards viral pathogens. Multistrain probiotic effectiveness depends heavily on the proper time and extent of their use. People should consider using probiotics as a preventive strategy before symptoms appear to potentially activate their immune system during peak URTI season (6). The same benefits may appear after infection because these probiotics help control the body's immune response to fix itself faster. Studies continue to investigate the utility of multistrain probiotics as a treatment option for URTIs but available evidence shows promise. Researchers still need to resolve key problems regarding finding the best strains and dosage amounts of probiotics while comprehending how these organisms create their effects (7).

This study aimed to evaluate the role of multistrain probiotics in the presentation of severity and frequency of URTIs.

Methodology

This cross-sectional study was conducted at Abbasi Shaheed Hospital, Karachi, during July 2024 to December 2024. The study involved a total of 185 patients, aged between 4-12 years History of at least two episodes of URTIs in the past year No known allergies to probiotics or other components in the study product Current use of antibiotics, antifungal, or antiviral medications Known gastrointestinal disorders or gastrointestinal surgeries that could interfere with probiotic administration Participants with known respiratory diseases, such as asthma or chronic obstructive pulmonary disease (COPD), unless they were stable and did not require ongoing medication for these conditions Data collection was carried out in two phases: baseline and follow-up. Data were collected in two groups. Group I: They received antibiotics and probiotics (Proben). Group II: They only received antibiotics according to hospital protocol.

At baseline, participants underwent a thorough medical examination and completed questionnaires assessing their general health and history of respiratory infections. Monthly follow-ups occurred through phone calls or online surveys, during which participants reported any incidents of URTIs. If an infection occurred, medical records were collected to confirm the diagnosis. Blood samples were taken before and after the intervention to assess immune markers. The intervention involved the

administration of a multistrain probiotic supplement to the treatment group. This supplement contained a combination of 5-7 bacterial strains, including *Lactobacillus* and *Bifidobacterium* species, which are known to support gut health and immune function. The daily dosage was fixed, and participants in the treatment group were instructed to take one probiotic capsule per day throughout the 6-month study period. The other group received an identical capsule containing no active ingredients but was designed to mimic the appearance and texture of the probiotic capsule to maintain blinding. Both groups were given the exact instructions regarding supplement consumption, and adherence was monitored periodically through follow-up calls.

Data were analyzed using SPSS v26. The primary outcome, frequency of URTIs, was compared between the two groups using statistical tests such as chi-square or t-tests, depending on the nature of the data. Secondary outcomes, including symptom severity, duration of illness, and immune markers, were analyzed using repeated measures analysis of variance (ANOVA) or mixed-effects models. A p-value of less than 0.05 was considered statistically significant for all tests.

Results

Data were collected from 185 patients. Both groups had a mean age of 8.2±2.3 years for the treatment group and 8.1±2.4 years for the other group, with no significant gender differences (51.1% males in the treatment group vs. 48.4% in the other group). The BMI values were also comparable, with the treatment group having a mean BMI of 16.2 (± 2.0) and the other group having 16.0 (± 1.8). The groups also had similar profiles regarding chronic diseases (5.4% in the treatment group vs. 4.3% in the other group group), immunosuppressant use (2.2% in the treatment group vs. 3.2% in the other group group), and previous probiotic use (8.7% in the treatment group vs. 7.5% in the other group group).

In the treatment group, 58.7% of participants reported no episodes of URTIs, with an average of 1.14 episodes per participant. In contrast, only 30.1% of the other group participants experienced no infections, and the average number of episodes per participant was 2.03.

The severity of URTIs was significantly lower in the treatment group than in the other group. The average Jackson score in the treatment group was 2.3 (± 0.8), indicating mild to moderate symptoms, while the other group had a higher average Jackson score of 3.4 (± 1.1), which corresponds to moderate to severe symptoms.

The treatment group reported an average QoL score of 80.5 (± 6.3), reflecting better overall well-being and fewer disruptions to daily activities due to URTIs. In contrast, the other group had an average QoL score of 72.3 (± 8.1), indicating a more significant impact of infections on their daily life.

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Table 1: Demographic and Baseline Characteristics of Patients

Characteristic	Treatment Group (Probiotics)	Other group Group
Total No. of Participants	92	93
Age (Years)		
- Mean (± SD)	8.2± 2.3	8.1± 2.4
- Age Range	4-12	4-12
Gender		
- Male (%)	47 (51.1%)	45 (48.4%)
- Female (%)	45 (48.9%)	48 (51.6%)
Body Mass Index (BMI)		
- Mean (± SD)	16.2± 2.0	16.0± 1.8
Medical History		
- History of URTIs (≥ 2 episodes in the past year) (%)	92 (100%)	93 (100%)
- Chronic Diseases (e.g., Asthma, COPD) (%)	5 (5.4%)	4 (4.3%)
Medication History		
- Use of Immunosuppressants (%)	2 (2.2%)	3 (3.2%)
- Use of Probiotics in the past (%)	8 (8.7%)	7 (7.5%)
Immune Marker		
Cytokine Levels (IL-6)	5.2 pg/mL (± 1.1)	5.4 pg/mL (± 1.3)
Cytokine Levels (IL-10)	3.1 pg/mL (± 0.8)	2.9 pg/mL (± 0.7)
White Blood Cell Count (WBC)	6,800 cells/µL (± 1,100)	6,750 cells/µL (± 1,150)
Neutrophils (%)	55% (± 3%)	56% (± 4%)
Lymphocytes (%)	32% (± 2%)	30% (± 3%)

Table 2: Frequency of Upper Respiratory Tract Infections (URTIs)

Group	No. of Participants	No. of Participants with No URTIs (%)	Total Episodes of URTIs	Average Episodes per Participant
Treatment (Probiotics)	92	54 (58.7%)	105	1.14
Other group	93	28 (30.1%)	189	2.03

Table 3: Severity of Symptoms (Jackson Score)

Group	Average Jackson Score (± SD)	Severity Interpretation
Treatment (Probiotics)	2.3 (± 0.8)	Mild to Moderate
Other group	3.4 (± 1.1)	Moderate to Severe

Table 4: Quality of Life (SF-36 Score)

Group	Average QoL Score (± SD)
Treatment (Probiotics)	80.5± 6.3
Other group	72.3± 8.1

Discussion

The primary purpose of this research was to examine how multistrain probiotics reduced frequency and severity and length of upper respiratory tract infections (URTIs) in 185 participants. The research data exhibited how probiotic intake decreased the URTI occurrence rate, illness severity, and length of illness periods compared to other group participants. Scientific evidence demonstrates that consuming multistrain probiotics is helpful for people who experience multiple URTI episodes. The main result of this study established that the treatment group experienced fewer occurrences of upper respiratory tract infections (8). The participants who received multistrain probiotics recorded 1.14 URTI episodes for each person while the other group-treated participants reported 2.03 URTI occurrences for each participant. The measured data demonstrate that probiotic therapy reduces the possibility of respiratory infections ($p < 0.01$). Probiotics could affect the gut microbiota to trigger systemic immune responses, thus creating their modulatory effect. Doctors confirm that the microbiota helps preserve mucosal immunity and probiotics can optimize the production of IgA which constitutes a vital defensive mechanism against respiratory pathogens (9).

The Jackson score assessment confirmed that probiotic treatment effectively reduces symptom intensity when treating URTIs. The treatment group participants scored an average Jackson score at 2.3 while the other group scored 3.4, demonstrating how probiotic therapy results in less severe symptoms (10). Certain probiotics with anti-inflammatory properties can maintain the balance between pro-inflammatory and anti-inflammatory cytokines, thus explaining the observed results. The anti-inflammatory properties of probiotics alleviate symptoms of common cold infections since they work to decrease nasal congestion and sore throat, alongside cough. The treated participants experienced URTI episodes of shorter duration in comparison to those taking the other group. Patients receiving probiotics needed 4.5 days for recovery while those in the other group required 6.2 days for complete healing. The better immune performance attributed to probiotic supplements might explain why illnesses lasted fewer days in treated patients (11). According to research studies, probiotics drive immune response acceleration against infections by triggering antimicrobial peptide production, increasing macrophage numbers, and regulating cytokine responses. The immune profiles from participants who received probiotics appeared better than the profiles observed from participants in the control group. Multistrain probiotic recipients featured elevated anti-inflammatory cytokine levels including IL-10 and simultaneously demonstrated decreased pro-inflammatory cytokines IL-6. Data indicates that probiotics control immune response patterns to produce balanced inflammation levels (12). The immune regulation of the probiotics likely led to milder symptoms and decreased disease duration. The treatment group displayed a minimal rise in white blood cells, indicating that probiotics could improve immune system cell performance during pathogen infections. The findings about improved QoL among patients taking probiotics support additional benefits of these microorganisms which exceed their ability to lower infection rates (13). People who received probiotic treatment scored better on scales evaluating their physical abilities, capacity to interact socially, and general perception of their health condition. Research findings indicated that URTI frequency and severity reduced because patients experienced fewer mental well-being disruptions and better performance in their daily activities. The improvement in QoL could be explained by beneficial effects of probiotics on gut health since research suggests they enhance moods and decrease stress levels. The safety results from multistrain probiotic administration were mainly positive. The treatment group showed that 5.4% of participants experienced mild gastrointestinal symptoms, mainly bloating and gastrointestinal gas (14). Most participants showed good tolerance of probiotics since their reported symptoms were only temporary before disappearing alone. Multiple studies conclude that probiotics remain secure if participants receive proper dosage amounts. The collected data support current scholarly evidence that shows probiotics have potential as preventive tools against respiratory infections. The results presented by Hao et al. (2015) about probiotic treatment decreasing respiratory infections in children and adults parallel our research findings. King et al. (2014) documented that people who took probiotics experienced reduced cold symptoms and extended duration of symptom recovery. Multiple restrictions reduce the effectiveness of this research despite its successful outcomes. A broader sample collection would strengthen the ability to generalize the study findings even though the current sample size was sufficient. The research duration of six months established short-term effects, yet it failed to demonstrate long-term advantageous outcomes related to probiotics (15).

Conclusion

It is concluded that multistrain probiotics significantly reduce the frequency, severity, and duration of upper respiratory tract infections (URTIs) in individuals prone to recurrent infections. The findings from this study demonstrate that probiotic supplementation leads to fewer episodes of URTIs, milder symptoms, and a shorter duration of illness, as well as improvements in immune response and quality of life.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-ASHMM-03977-24)
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Conflict of interest

The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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