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Original Research Article

Study on Role of Probiotics in Recurrent Respiratory Infections

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Abstract

Introduction: Children's respiratory tract infections (RTIs) are one of the most common health issues. Probiotics are live bacteria that invade the intestines and modify the microbiota of the host. A growing body of research indicates that taking probiotics may alter or reduce the frequency of RTIs.

Aims: The aim of this on health effects of probiotics in patients with RTI, with a focus on viral respiratory infections.

Materials and Methods: A randomized, double-blind, placebo-controlled investigation was carried out. given daily probiotics including lactobacillus acidophilus and bifido bacterium over the 6-month intervention trial period. 400 participants, ages 3 to 6, were chosen for the research.

Results: When compared to the placebo group, the active group's overall RTI symptom duration (measured in days) was significantly shorter. Without the use of probiotics, the incidence rate of RTI symptoms is considerable.

Conclusion: Probiotic supplements offer a way to lower the prevalence of RTIs in preschool-aged children who visit day care centers.

Keywords: Respiratory tract infections (RTIs), Probiotics, Lactobacillus acidophilus and Bifido bacterium.

Introduction

One of the most prevalent infectious disorders, whether bacterial or viral in nature, is respiratory tract infection (RTI). Both lower respiratory tract infections (LRTI) and upper respiratory tract infections (URTI) are subtypes of the illness. The nose, sinuses, throat, and larynx are all parts of the upper respiratory system. It is a worldwide health concern that can cause difficulties including acute respiratory distress syndrome (ARDS), respiratory failure, multiple organ failure, or even mortality (about 10%). It can affect both the upper (sinuses, nose, and throat) and lower (windpipe and lungs) respiratory tracts.

Probiotics have demonstrated efficacy in the therapeutic treatment of many ailments. It is widely known that Lactobacillus inhibits the hemagglutinin type 1 and neuraminidase type 1 (H1N1) influenza virus, rotavirus, gastric coronavirus, HIV, and reduces the viral load in vivo. Probiotics are described as living bacteria that are beneficial to the host's health and include immunostimulatory chemicals such muramyl dipeptide, a Nod-like receptor ligand, lipoteichoic acid, and peptidoglycan, which are Toll-like receptor (TLR) ligands.

Certain probiotics have been proposed to be useful in reducing the length and severity of acute rotavirus gastroenteritis, given the positive benefits of probiotics in viral infections [1].

Additionally, a growing body of research indicates that probiotics are helpful for RTIs [2], which are typically viral in nature.

Nevertheless, little is known about the processes behind these impacts. Presenting the health benefits of probiotics in RTI patients—with an emphasis on viral respiratory infections—is the goal.

Materials and Methods

A randomized, double-blind, placebo-controlled investigation was carried out. given daily probiotics including lactobacillus acidophilus and bifidobacterium over the 6-month intervention trial period. 400 participants, ages 3 to 6, were chosen for the research. Parents gave their written informed permission before they could take part in the study. Children who had previously taken medicine, immunostimulatory goods, or any kind of probiotic were not allowed. During the trial period, no youngster got the flu vaccination.

We gathered background data on the child's dietary practices, ailments, and the family and surroundings. Parents who had respiratory symptoms (fever, runny nose, sore throat, cough, chest wheezes, earache) during the trial kept a daily symptom journal. They also included medical diagnoses, antibiotic prescriptions, and absences from the daycare facility. Among the signs of a URTI were runny and clogged nose, cough, sore throat, and sneezing. Every discrete episode was defined as the duration (measured in days) of the persistent manifestation of symptoms, with a minimum 24-hour interval between each episode. A pediatric physician verified the beginning of LRTI, and the length of LRTI was the number of days between the physician's confirmation and the cessation of symptoms. Changes in urine metabolites, salivary IgA, and plasma cytokines were the secondary end goals. Measures reported by parents included vomiting, stomach pains, and diarrhea (defined as more than three loose stools in a 24-hour period).There was no official sample size calculation because this was a pilot research. In the primary end point analysis, a generalised linear model (GLM) with treatment included as a single predictor was used to calculate the incidence rate ratio (number of episodes divided by the number of study days), mean difference in the duration of URTIs and LRTIs, absence from preschool, and number of visits to paediatric center for RTIs during the intervention period with 95% confidence intervals (CIs).

Results

There were four hundred kids registered. Three kids withdrew from the research and failed to provide any documentation. Nine children were left out of the PP analysis: three because the follow-up period was not completed, and six because therapy was used without authorization.

Table 1: Baseline demographics

Gender	Without probiotics	With probiotics
Girls	100	100
Boys	100	100
Age (years) [a]		
Girls	4.8 ±0.4	4.8 ±0.7
Boys	5.0 ±0.4	5.1 ±0.6
BMI (kg/m^2)[a]		
Girls	15.8 ±0.3	15.5 ±0.9
Boys	15.2 ±0.6	15.5 ± 0.8
Eczema	2 ± 0.1	7 ±0.9
Atopic disease	2 ± 0.1	6 ± 0.2
Food allergy	0	3 ± 0.3

Baseline data for both groups appears comparable.

Table 2: Duration of URTI symptoms, absence and paediatric physician visits

	Without probiotics	With probiotics
URTI symptoms		
Mean (s.d.), days	43± 3	22±4
P-value	0.006	
Individual URTI symptoms		
Sneezing		
Mean (s.d.), days	10 ± 3	2 ± 1
P-value	0.010	
Cough		
Mean (s.d.), days	23.5±5	11.9 ± 3
P-value	0.006	
Runny nose		
Mean (s.d.), days	21.4 ± 6	11.5 ± 5
P-value	0.072	
Blocked nose		
Mean (s.d.), days	9.8 ± 5	4.9 ± 4
P-value	0.285	
Sore throat		
Mean (s.d.), days	2.8 ± 3	1.9 ±1
P-value	0.332	

Absence, physician visits		
Absence from preschool due to URTI		
Mean (s.d.), days	14.2 ± 4	7.5 ±4
P-value	0.070	
Number of physician visit due to URTI		
Mean (s.d.)	2.9 ± 3	1.6 ± 2
P-value	0.082	

Abbreviations: CI, confidence interval; ITT, intention to treat; URTI, upper respiratory tract infection.

When comparing the active group to the placebo, there was a notable decrease in the total number of days that the URTI symptoms persisted.

Table 3: Incidence rate of URTI symptoms and absence

	P-*value*
URTI symptoms	0.002
Individual URTI symptoms	
Sneezing	<0.001
Cough	<0.001
Runny nose	0.005
Blocked nose	0.600
Sore throat	0.235
Absence	
Absence from preschool	0.007

The incidence rate of URTI symptoms is significant without using probiotics.

Discussion

Children who attended preschool facilities for six months after taking a combination of vitamin C and the Lab4 probiotic consortium supplementation exhibited a decrease in the frequency and length of URTI symptoms. Probiotic-only studies on URTIs have had mixed results; some have reported considerable decreases in incidence and duration, while others have found little to no change. [4,5,6]

Limited evidence suggests that supplementing with low dose vitamin C (<0.2 g per day) may shorten the duration of common colds, as discussed by Hemila et al., while positive effects on URTI have been reported in response to Lactobacillus casei DN-114 001, Lactobacillus rhamnosus GG, and Lactobacillus acidophilus NCFM alone or in combination with Bifidobacterium animalissp lactis Bi-07 at doses ranging from 109 to 1010 colony-forming units per day.[7] Adults who took a probiotic consortium along with multivitamins and minerals saw a 13.6% decrease in the frequency of symptoms associated with both LRTI and URTI.[8] Benefits on LRTI and gastrointestinal symptoms have been documented elsewhere; however, no effect was seen in this trial.[10,9]

Children who received the combination of Lab4 and vitamin C missed fewer days of preschool and had fewer unplanned trips to the pediatrician, indicating that the severity of infections may be lessened by the combined supplementation. Probiotics, echinacea, and propolis combined with 150 mg of vitamin C daily have been shown to reduce absences from preschool.[10]The number of days that cough medicine was used was significantly reduced, and fewer children receiving the supplement were treated with oral antibiotics, in line with other probiotic studies. These findings demonstrate the possible socio-economic benefits linked to the combination supplement.[3]

A novel method known as "metabolomics" offers a methodical examination of the chemical byproducts, or "metabolites," found in biological materials including blood, urine, and feces. It is thought to be an extremely sensitive indicator of an organism's phenotype.In this investigation, there were no differences between the active and placebo groups in the urine metabolite profiles of healthy preschool-aged children. The primary metabolites found in the 1H NMR spectrum data matched those seen in youngsters in good health.[11] The combination of both probiotics is likely to mediate a response through immune-modulation, as both are known to do. However, the lack of discernible changes in cytokine levels between the active and placebo groups in our study may point to the existence of a different mechanism. While there were no noteworthy variations in salivary IgA levels between the active group and placebo, Cáceres et al.[6]found that children who received Lactobacillus rhamnosus HN001 supplementation had higher IgA levels in their feces, but they were unable to link this observation to any amelioration of URTI symptoms.. As demonstrated by the ability of vitamin C and the Lab4 consortium to induce an anti-inflammatory response in immune

cells isolated from the blood of healthy subjects, the trend towards a reduction in IL-2/IL-5 and IFN-γ levels may point to a shift towards an anti-inflammatory state in the supplemented group.[12]

A gender-based subgroup analysis of our cohort showed that boys had less URTI symptoms, which correlated with lower plasma levels of IL-12p70, IL-12p70/IL-10, IL-2/IL-10, and IL-12/IL-5, suggesting a more anti-inflammatory state of the basal immune system. Male participants in their adolescence and adulthood have shown positive responses to RTIs when given probiotics and vitamin C, and it is well known that male-specific immune-modulatory genes particular to the X chromosome regulate these responses during prepubescence.[13, 14]

Due to the limited sample size and non-participant refusal of blood or saliva, the power to detect all statistically significant changes was not achieved in this pilot project. Additionally, the size of the samples was lowered for the secondary end point analysis. Furthermore, this study did not assess the intervention's effects throughout an infection.

Conclusions

Probiotic supplementation offers a method to lower the prevalence of URTIs in children aged 3-6 who visit daycare centers. Although promising, these findings must be verified in a larger sample size.When considered as a whole, the current research revealed that consuming probiotics may reduce the frequency and length of RTI episodes. Future trials should take into account the best probiotic strains, dosage, mode of administration, timing of the intervention, and long-term follow-up. Additionally, research is required to determine the mechanisms underlying probiotics' beneficial effects on RTI in kids.

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