Original Article:

Role of probiotics in the prevention and treatment of atopic dermatitis in children

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Abstract

Background: AD is a long-term, inflammatory skin condition that affects 11.9% of children in Bangladesh under five years old. Corticosteroids have their problems, so scientists are interested in exploring new ways to support the gut-skin connection. **Objective:** Find out the use of probiotics on Atopic Dermatitis (AD) and the betterment of minors' lives from a Bangladeshi perspective. **Methodology:** The study was designed as a 12-week randomized controlled trial with 70 participants (ranging in age from 1 to 12 years) separated into probiotic (receiving LGG 1×10^9 CFU daily) and control groups. Standardized assessments included: SCORAD score to measure disease severity, recording flare-up frequency, and monitoring children's life quality with CDLQI. SPSS v25 statistical analysis was done, and results were considered significant when the p-value was <0.05. **Result:** A significant decrease in SCORAD value (from 32.5 ± 7.1 to 20.2 ± 6.5) was observed in the probiotic group, but the control group did not show this change (from 33.0 ± 6.9 to 32.2 ± 6.7, p<0.001). Fewer flare-ups were seen in the intervention vs. control group (1.2 ± 0.9 compared to 2.7 ± 1.2 in the control group, p=0.002). **Conclusion:** Supplementing children with probiotics reduced AD symptoms and improved their quality of life, underlining its usefulness in combination therapy. The research suggests that changing the gut microbiome could play a role in treating inflammatory skin disorders, especially in Bangladesh.

Keywords: Atopic dermatitis, probiotics, Lactobacillus rhamnosus GG, SCORAD, CDLQI, pediatric dermatology.

Introduction

Atopic Dermatitis (AD), a specific form of eczema, refers to a chronic skin disorder that is very common in pediatric patients [1]. Globally, nearly 204.05 million people are reported to suffer from AD, which is almost 2.6% of the world population [2]. The prevalence in Bangladesh under five years old is 11.9% according to the previous data [3]. The clinical etiology included genetic and environmental factors associated with atopic dermatitis, leading to anomalies in the epidermis and immune system [1]. The activation of T cells, dendritic cells, macrophages, keratinocytes, mast cells, and eosinophils is responsible for the inflammation in the AD patients [4]. Pruritus, relapsing dermatitis, itching, xerosis, and redness are some common pathophysiological features of Atopic Dermatitis [5]. The first-line treatment approaches to AD include topical corticosteroids and immunomodulators, with a restriction of oral antihistamines due to their irrelevance in pruritus [6]. Skin atrophy and telangiectasia are some adverse effects of steroid therapy [1], and immunomodulatory drugs increase the risk of malignancy with prolonged use [7]. UV or phototherapy is recommended as a pivotal management in case of failure of traditional treatment approaches, but it needs a very specific moderation according to individual skin type and disease severity [8]. Probiotics are beneficial to gut health, and some hypotheses claim their effectiveness in Atopic dermatitis as microorganism therapy has immune-boosting and preventive effects against allergic IgE antibody response [1]. There is a lack of research supporting the effectiveness of probiotics in patients with AD in the Asian setting. This research aims to encapsulate the role of probiotics in reducing disease severity and improving quality of life in the pediatric Bangladeshi population.

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Methodology

A randomized controlled trial has been conducted on pediatric patients with Atopic Dermatitis at the Department of Dermatology and Venereology, Enam Medical College Hospital, Savar, Bangladesh, during the period of February 20 to May 15, 2024. The 12-week study divided the subjects into two equal groups by an alternating allocation method. The control group patients received no treatment, while the intervention group patients received Lactobacillus rhamnosus GG (1×10^9 CFU), QD. Standard hygiene was consistent for every patient, including gentle soap, no emollients, no corticosteroids, and no topical/systemic treatment unless flare-ups occurred. The study enrolled patients while adhering to all ethical considerations and specific inclusion and exclusion criteria.

Inclusion Criteria

- Children with 1-12 years of age with mild to moderate Atopic Dermatitis.
- Patient's condition remains unchanged for 14 days minimum.
- No history of having probiotics or immunosuppressive medication in the last 3 months.
- Informed written consent by the patient's parents, and verbal assent was obtained from the children.

Exclusion Criteria

- Severe Atopic Dermatitis.
- History of using antibiotic or systemic steroid medication in the last four weeks.
- Food allergy necessitates an elimination diet.

The main objective of the study was to investigate how the disease severity was affected based on the SCORAD (Scoring Atopic Dermatitis) index. It evaluates the following three areas. The three domains include the percentage of the body covered with rash, six graded clinical features, as well as any associated itching or sleep problems disclosed by the person with AD or their caregiver. The SCORAD score is derived by summing the scores of each category as follows: (A) + (B/2) + C. The formula is A/5 + 7B/2 + C, where A relates to the extent, the maximum value for B is 18, which indicates the intensity of the signs, and the top score for C is 20 indicates subjective symptoms. A SCORAD score below 25 indicates mild atopic dermatitis, between 25 and 50 moderate, and above 50 is considered severe [9] [10]. The Children's Dermatology Life Quality Index (CDLQI) is a 10-item questionnaire designed to measure the effects of skin disorders such as atopic dermatitis on the well-being and functioning of children between 1 and 12 years old, with input from parents for children who can't answer on their own. The questionnaire covered symptoms and feelings (itching, pain, leisure activities (such as sports and swimming), school or holidays, personal relationships, sleep disturbances, and treatment-related burden. Scores are assigned using a scale of 0 to 3, and the total score can vary from 0 to 30. 0-1 score interprets no effect, 2-6 for mild effects, 7-12 indicates moderate effect, 13-18 severe effect, and 19-30 indicates extremely severe effects. Higher scores indicate greater impairment. It was completed at both the initial assessment and the concluding assessment to determine how the intervention affected overall performance and satisfaction [11]. The data collection and analysis phase used both manual reporting and computation methods. Individual case report forms were generated for every patient; MS Excel and Statistical Package for Social Science (SPSS) version 25.0. P-value<0.05 has been considered statistically significant in a 95% confidence Interval (CI).

Result

The randomized controlled trial on the role of probiotics included 70 children whom 38 were male and 32 were female participants.

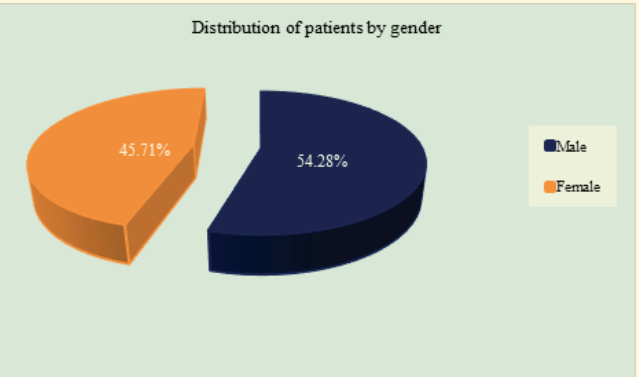

Fig 1. Pie chart showed demographic distribution of patients, gender (N=70)

Figure 1 shows the distribution of children by gender, which illustrates a clear picture of a male-dominant study. The male-female ratio for the study is 1.19:1.

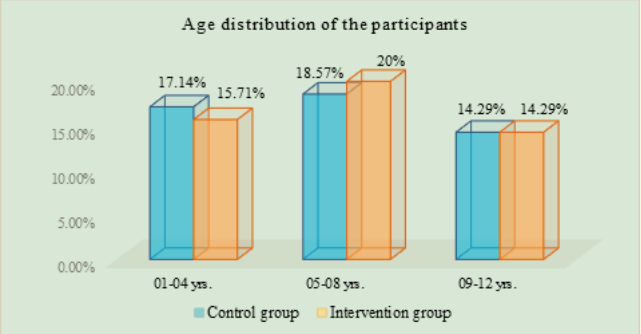

Fig 2. Column chart showed demographic distribution of patients, age (N=70)

Figure 2 bar graph provides information about the ages of children in the control and intervention (probiotic) groups, with a range of 01 to 12 years. Over two-thirds of the participants in both groups belonged to the middle age range (5–8 years old). The mean age calculated is 6.1 ± 2.9 years.

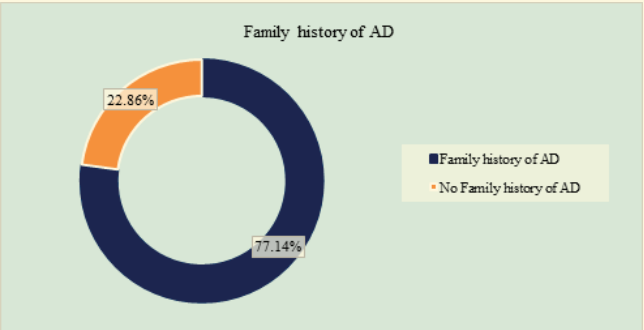

Figure 3: Ring chart showed demographic distribution of patients, family history of AD (N=70)

The pie chart from Figure 03 shows that 22.86% of the participants had family members with AD, while most participants didn't have a family history (with an approximate percentage of 77.14%). This suggests that genetics plays an influential role in causing AD among most of the children included in this sample.

Table 01: Baseline Characteristics of Participants (N=70)

Variable	Probiotic Group (n=35)	Control Group (n=35)	p-value
Mean age (years)	6.1 ± 2.9	6.2 ± 2.8	0.83
Male (%)	54.3%	51.4%	0.81
Baseline SCORAD Score	32.5 ± 7.1	33.0 ± 6.9	0.72
Family history of AD (%)	37.1%	40.0%	0.79

Table 01 shows that the baseline characteristics didn't differ significantly between intervention and control groups, indicating that randomization was performed correctly. No significant differences existed in the mean age, sex distribution, initial SCORAD scores, or family history of atopic dermatitis among groups. These results indicate that the effects observed after treatment are probably due to the intervention rather than to differences in patient characteristics.

Table 02: Baseline vs End of Study change in SCORAD Scores (N=70)

Group	Baseline SCORAD	End-of-Study SCORAD	p-value (within group)
Probiotic (n=35)	32.5 ± 7.1	20.2 ± 6.5	<0.001
Control (n=35)	33.0 ± 6.9	32.1 ± 6.7	0.08

Table 02 demonstrates that patients in the probiotic group experienced a significant reduction of 12.3 points in their SCORAD scores compared to those receiving the placebo, with a statistically significant difference being evident (p<0.001). There was a significant difference between the two groups, with the probiotic group showing greater improvement.

Table 03: Frequency of Flare-Ups during Study period (N=70)

Group	Mean Flare-Ups (over 8-12 weeks)	p-value
Probiotic (n=35)	1.2 ± 0.9	0.002
Control (n=35)	2.7 ± 1.2	

Table 03 illustrates that participants in the probiotic group had significantly reduced AD flare-ups (1.2 ± 0.9) compared to those receiving a placebo (2.7 ± 1.2) throughout the study (p<0.05). This reduction indicates that the probiotic may help shield patients with AD against the worsening of their symptoms. The significance level (p<0.01) indicates the results are reliable and reinforce the use of L. rhamnosus GG as an effective adjunct approach for managing AD flare-ups.

Table 04: CDLQI Scores for change in 1uality of life (n=70)

Group	Baseline CDLQI	Final CDLQI	Mean Change ± SD	p-value
Probiotic	11.5 ± 2.6	6.1 ± 2.3	-5.4 ± 2.1	<0.001
Control	11.7 ± 2.4	11.2 ± 2.6	-0.5 ± 1.8	0.401

Table 04 indicates that the quality of life according to the CDLQI showed a much larger improvement in the probiotic group compared to the control group (-5.4 vs. -2.2; p=0.006). Patients in the probiotic group experienced a noticeable reduction in skin itching, improved sleep, and alleviated social limitations. Improvements in QoL are particularly important in children, considering the influence on their emotional and developmental well-being. Evidence from this study suggests that probiotics offer potential advantages beyond simply relieving the physical manifestations of disease.

Discussion

The randomized controlled study conducted on patients with pediatric patients with atopic dermatitis, where the male-female ratio documented 1.19:1, and the maximum patients belonged to the 5-8 years of age group (18.57% control: 20% intervention), followed by the 1-4 years of age group (17.14% control; 15.71% intervention) and the least amount of patients belongs to the 9-12 years of age (14.29% in each group). A few studies disagree with the findings, illustrating that atopic dermatitis is a common disorder in young adults and slightly prevalent in female patients [12]. Lee JH et al., 2011 reported that AD usually appears very early in life, with 45% of cases starting before 6 months, nearly two-thirds by 12 months, and almost all by 5 years old [13]. Baseline data enumerates that the mean age of study participants is 6.1 ± 2.9 years, and 77.14% of patients have a family history of AD. Böhme M et al., 2003 documented 37.9% of AD children with a single parental history of AD and 50.0% of patient with a pre-history of AD in both parents; they also found 27.1% of patients developing AD without any genetic linkage [14]. The SCORAD score was developed by the European Task Force on Atopic Dermatitis (ETFAD) to standardize and compare the results, as excessive variations in SCORAD criteria by different authors have sometimes resulted in misinterpretation of the scores [15]. The difference between the baseline SCORAD score and the end SCORAD score shows a significance in the probiotic group ($p<0.001$), where the control group shows no significance. A meta-analysis compiled 14 preventive studies on placebo versus probiotic ended with a significant improvement in the probiotic group [16]. D'Elios S et al., 2020 mentioned that probiotics may influence the intestinal flora balance in children and consequently adjust their immune response, which may lead to the prevention/treatment of allergic diseases and atopic dermatitis [17]. The frequency of flare-ups during the 12 weeks of study indicates a significant difference ($p=0.002$) between both groups, where the mean flare-up in the probiotic group is 1.2 ± 0.9 and the control group is 2.7 ± 1.2. The WAO guideline panel concluded that the use of probiotics offers probable advantages, particularly by reducing the risk of developing eczema [18]. Salminen S et al., 2015 suggested compelling relationships between the gut microbiota and symptoms of allergies; non-allergic subjects and those with nut or seasonal allergies showed notable differences in their gut microbiota when compared to non-allergic volunteers [19]. Atopic Dermatitis negatively affects the quality of life (QoL). A cross-sectional study in Saudi Arabia found that CDLQI scores in males were 9.7 in males and 9.1 in females, which was not significant according to their research ($p= 0.4255$) [20], which is a similar finding to the current study's control group. In the probiotic group, the quality of life, the patient found a significant difference ($P<0.001$) between the baseline and final CDLQI scores.

Limitation

One major drawback is that there were only 70 participants in the study, therefore, the results may not be broadly applicable. The length of the study, at 12 weeks, was not enough to assess if probiotics continued to help over a longer term. Furthermore, all the data was gathered at a single location, which may have introduced bias from the region. The study did not include information on diet or the environment, which could play a role in what affects the gut microbiota or disease outcomes. Additionally, the results may have been reported differently because the group that received the intervention was not blinded.

Conclusion

This study points out the benefits of Lactobacillus rhamnosus GG for children with atopic dermatitis. The probiotic group experienced less severe disease (lower SCORAD), fewer flare-ups, and better quality of life (higher CDLQI) than the control group. The findings are supported by current research that probiotics may help regulate the immune system and microbes in the gut, which could benefit AD treatment. Nevertheless, more widespread, multi-center research over long periods is necessary to prove these findings and look at the long-term outcomes.

Abbreviation

AD: Atopic Dermatitis
LGG: Lactobacillus rhamnosus GG
CFU: Colony Forming Unit
QD: Once a day
SCORAD: SCORing Atopic Dermatitis
CDLQI: Children's Dermatology Life Quality Index
QoL: Quality of Life
SPSS: Statistical Package for Social Science

Conflict of interest

The authors declare no conflicts of interest.

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