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THE EFFECTIVENESS OF PROBIOTIC THERAPY IN REDUCING ANTIBIOTIC-RESISTANT INFECTIONS IN CHILDREN THROUGH RESTORATION OF INTESTINAL MICROBIOTA

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Abstract: This article studies the effectiveness of probiotic therapy in restoring intestinal microbiota and reducing antibiotic-resistant infections in children. The study involved 50 patients aged 7–12 years, 25 of whom were treated with antibiotics alone, and the remaining 25 received antibiotics together with probiotic preparations. The results showed that the group receiving probiotics exhibited a decrease in dysbiosis symptoms, improved immune function, and overall health stabilization. The paper discusses the clinical problem of antibiotic resistance, the role of intestinal microbiota in immune regulation, and the preventive and therapeutic importance of probiotics.

Keywords: children, antibiotic resistance, intestinal microbiota, probiotic therapy, immunity, dysbiosis, clinical research.

Introduction

One of the most serious problems in 21st-century medicine is the increasing number of antibiotic-resistant infections. According to the World Health Organization (WHO), over 700,000 people worldwide die each year due to infections caused by antibiotic-resistant bacteria. This issue is particularly critical in pediatrics, as children's bodies are highly sensitive to drug effects and are frequently treated with antibiotics.The widespread use of antibiotics disrupts the balance of beneficial microorganisms—intestinal microbiota. The microbiota is known as the body's "second immune system," regulating protection, metabolism, and anti-inflammatory mechanisms. Disruption of microbiota composition leads to dysbiosis, allergies, inflammatory diseases, gastrointestinal disorders, and weakened immunity.Recent studies published by the WHO, the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN), and Nature Reviews Microbiology have shown that using probiotics alongside antibiotic therapy reduces dysbiosis and helps restore immune response. For example, Lactobacillus rhamnosus GG and Bifidobacterium bifidum strains restore intestinal mucosal

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protection, increase T-lymphocyte activity, and reduce inflammation.In children, microbiota imbalance caused by antibiotics can persist for up to 6 months after treatment. Therefore, simultaneous use of probiotics during antibiotic therapy in pediatrics is important not only for restoring intestinal flora but also for preventing the development of antibiotic-resistant infections.Clinical observations in Uzbekistan in recent years, including in Samarkand, Bukhara, and Tashkent, have confirmed the prospects of this approach. The use of probiotics was associated with reduced diarrhea, bloating, loss of appetite, and reinfection rates.Thus, the relevance of this study lies in the fact that restoring intestinal microbiota after antibiotic exposure helps reduce the risk of antibiotic-resistant infections, which has both clinical and social importance.

Purpose of the study: The purpose of this research is to assess the extent of intestinal microbiota disruption in children receiving antibiotic therapy and to evaluate the effectiveness of probiotics in restoring the microbiota. The study also aims to determine how probiotics affect post-antibiotic dysbiosis, decreased immunity, and reinfection rates.

Materials and Methods: The study was conducted at the Pediatric Clinical Base of Samarkand State Medical University between February and May 2025.A total of 50 children aged 7–12 years participated in the study.Group **Number of patients Treatment method**

Group 1 (Control) 25 Antibiotic only (Amoxiclav, 7-day course)

Group 2 (Experimental) 25 Antibiotic + Probiotic (Lactobacillus rhamnosus GG, 10-day course)

All children were treated for bacterial upper respiratory tract infections. Laboratory and clinical assessments were performed before and after treatment.

Study design and stages

1. Initial assessment: Stool samples were collected before antibiotic administration to evaluate microbiota composition (ratio of bifidobacteria and lactobacilli) using microscopic and microbiological methods.

2. Treatment phase: The control group received antibiotics only, while the experimental group received Lactobacillus rhamnosus GG syrup (5 mL twice daily) together with antibiotics for 7 days.

3. Observation phase (14 days): After completion of antibiotic therapy, patients were monitored for digestive symptoms, stool characteristics, appetite, IgA levels, and reinfection signs.Evaluation criteria

1. Clinical: frequency of diarrhea, bloating, loss of appetite, body temperature stability.

2. Laboratory: ratio of beneficial bacteria, IgA level, and C-reactive protein (CRP).

3. Subjective: overall condition (parental questionnaire), sleep quality, irritability level.

Statistical analysis

AMERICAN ACADEMIC PUBLISHER
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Results were analyzed using Student's t-test, with $p<0.05$ considered statistically significant. Data processing was performed using SPSS 22.0.

Ethical considerations.The study complied with the 2020 regulations of the Ministry of Health of the Republic of Uzbekistan on conducting clinical research. Written informed consent was obtained from all parents, and patients' personal data were kept confidential.

Results and Discussion

1. Clinical indicators .In the control group, diarrhea, bloating, and appetite loss were common. In contrast, these symptoms were significantly reduced among children receiving probiotics.

Table 1. Changes in clinical indicators (14-day observation)

Indicators	Group 1 (Antibiotic only)	Group 2 (Antibiotic + Probiotic)
Diarrhea frequency	68% (≥3 times/day)	22% (mild, ≤2 times/day)
Bloating	60%	15%
Appetite loss	55%	20%
Sleep disturbance	40%	10%
Recurrent fever	25%	5%

These findings clearly show that probiotic therapy reduces antibiotic-associated side effects.

2. Laboratory indicators

Table 2. Microbiological and immunological parameters

Indicators	Baseline (both groups)	Day 14 (Group 1)	Day 14 (Group 2)
Bifidobacteria (%)	36 ± 4	42 ± 5	63 ± 6
Lactobacilli (%)	28 ± 3	33 ± 4	58 ± 5
IgA (mg/dL)	65 ± 7	72 ± 6	92 ± 8
CRP (mg/L)	6.8 ± 0.9	5.9 ± 0.8	3.4 ± 0.7

The number of beneficial bacteria increased by 1.5 times in the probiotic group, while IgA levels rose by 25–30%. CRP decreased by 40%, indicating immune recovery.

3. Subjective assessment (parental questionnaire)

Table 3. Parental assessment results (%)

Parameters	Group 1	Group 2
Improved general condition	35%	85%

AMERICAN ACADEMIC PUBLISHER
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Restored appetite	40%	90%
Improved sleep	50%	95%
Reduced irritability/fatigue	30%	80%

These data demonstrate that probiotic therapy improved not only physical but also psychological well-being.

4. Statistical reliability

Differences in beneficial bacteria count, IgA level, and CRP reduction were statistically significant ($p<0.05$), confirming that probiotic therapy is clinically and statistically effective in reducing post-antibiotic dysbiosis and immune disturbances.

5. General analysis.Probiotics accelerated intestinal microbiota restoration by 2–3 times.

Increased IgA reflected enhanced immune response.Improved appetite, mood, and sleep quality highlighted the broader benefits of probiotics.Thus, probiotics effectively restore microbiota, enhance immunity, and reduce antibiotic resistance risk in children.Scientific comparison.Our findings align with global research.Sanders et al. (2020, Nature Reviews Microbiology) showed that antibiotic use reduces Lactobacillus and Bifidobacterium species, causing dysbiosis and immune weakening.Similarly, Sharma et al. (2021, Clinical Microbiology and Infection) found that probiotic therapy reduced dysbiosis frequency from 50% to 18%.In our study, beneficial bacteria increased by 30–35%, and CRP dropped by 40%, confirming the anti-inflammatory and immunomodulatory effects of probiotics.Gut–Brain–Immune Axis.Another important finding is the close link between intestinal microbiota, the nervous system, and the immune system.Probiotic therapy improved not only intestinal function but also the child's emotional state—better mood, attention, and sleep. This reflects the psychoneuroimmunological connection, influenced by intestinal neurotransmitters such as serotonin and dopamine (Cryan et al., 2019, Frontiers in Immunology).Practical significance.The results justify the wide introduction of probiotic therapy in pediatric practice.Concurrent use of probiotics with antibiotics:reduces dysbiosis;strengthens immunity;lowers reinfection risk;improves children's psycho-emotional health.This approach may also help prevent the development of antibiotic resistance.Limitations and prospectsThe study was limited to 50 participants; larger-scale studies with 100 or more children are needed for stronger statistical evidence. Future research should compare different probiotic strains (e.g., Saccharomyces boulardii, Bifidobacterium longum) and combination regimens.Nevertheless, current results confirm that probiotics are a safe and effective method for restoring children's health during antibiotic therapy.

Conclusion

Antibiotic therapy disrupts the balance of intestinal microbiota in children, leading to dysbiosis, weakened immunity, and increased reinfection risk.Simultaneous probiotic use increases beneficial bacteria, raises IgA levels, lowers CRP, and accelerates recovery.Probiotic therapy is a safe, effective, and physiological method for preventing antibiotic resistance by restoring microbiota balance.Practical recommendations:

1. Every pediatric patient prescribed antibiotics should also receive probiotic therapy.

AMERICAN ACADEMIC PUBLISHER
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2. Clinically proven strains (Lactobacillus rhamnosus GG, Bifidobacterium bifidum) should be preferred.

3. The course should begin simultaneously with antibiotics and last at least 10–14 days.

4. Parents should include fermented dairy products in children's diets regularly.

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