

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

MICROBIOTA AND IMMUNE REGULATION IN FREQUENTLY ILL CHILDREN

Nargiza F. Nurmatova

Tashkent State Medical University, Tashkent, Republic of Uzbekistan

E-mail: nargiza-nurmatova78@yandex.ru

ORCID: 0000-0002-2770-5735

Abstract

Introduction. The intestinal microbiota plays a pivotal role in the development and regulation of the child's immune system. Alterations in its composition may contribute to immune dysfunction and increased susceptibility to infectious diseases.

Objective. To investigate the role of the intestinal microbiota in immune response regulation in frequently ill children.

Materials and methods. A comparative clinical and laboratory study was conducted alongside an analysis of current scientific literature on intestinal microbiota and immune regulation in children. The study included 52 frequently ill children aged 3–12 years and 30 apparently healthy children in the control group. The composition of intestinal microbiota, frequency of acute respiratory infections (ARIs), and selected immunological parameters were assessed.

Results. Frequently ill children exhibited a significant decrease in Bifidobacterium and Lactobacillus, along with an increased proportion of opportunistic microorganisms. These changes were accompanied by decreased levels of secretory IgA and elevated IgE and IL-6. A significant association was found between microbiota imbalance, altered immune status, and increased frequency of ARIs.

Conclusion. Disturbances in intestinal microbiota in frequently ill children are associated with reduced immune resistance. Correction of intestinal

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

microbiocenosis may represent a promising strategy for the prevention and comprehensive management of infectious diseases

Keywords: Intestinal microbiota, immune regulation, frequently ill children, dysbiosis, secretory IgA, IL-6.

INTRODUCTION

In recent decades, the intestinal microbiota has been increasingly recognized as a key regulator of the human immune system. Microorganisms inhabiting the gastrointestinal tract form a complex ecosystem involved in maintaining metabolic, barrier, and immune homeostasis [1,2].

The formation of intestinal microbiota begins in the early neonatal period and is influenced by multiple factors, including mode of delivery, type of feeding, antibiotic exposure, and environmental conditions [3,5,8]. During the first years of life, the microbial composition undergoes dynamic changes that significantly affect the development of both innate and adaptive immunity [3,11,12].

The intestinal microbiota contributes to immune system maturation through interactions between microbial antigens and innate immune cells, as well as through the stimulation of cytokine production, secretory immunoglobulins, and regulatory T cells [2,4,7]. Particularly important is its role in maintaining mucosal immunity and immune tolerance [7,26,27].

The condition of intestinal microbiota is of special importance in frequently ill children. Recurrent acute respiratory infections, chronic inflammatory diseases, and allergic conditions are often associated with microbial imbalance in the gut [10,15,17,18]. A reduction in microbial diversity and an increase in opportunistic microorganisms contribute to dysbiosis and altered immune reactivity [4,9,13].

Recent studies highlight a close relationship between intestinal microbiota and respiratory health within the framework of the gut–lung axis [15–20]. However, the mechanisms by which microbiota influences immune resistance in frequently

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

ill children remain insufficiently understood, which determines the relevance of this study.

Objective: to investigate the role of intestinal microbiota in the regulation of immune response in frequently ill children.

MATERIALS AND METHODS

A comparative clinical and laboratory study was conducted along with an analysis of current scientific literature on intestinal microbiota and immune regulation in children.

The study included 52 children aged 3–12 years classified as frequently ill and observed in outpatient settings. The inclusion criterion was the presence of six or more episodes of acute respiratory infections per year. The control group consisted of 30 apparently healthy children of comparable age.

All participants underwent clinical examination, assessment of medical history, and evaluation of infection frequency. The state of intestinal microbiota was assessed based on microbiological analysis of stool samples.

The levels of Bifidobacterium and Lactobacillus, the presence of opportunistic microorganisms, and immunological parameters including secretory IgA, IgE, and IL-6 were determined.

Quantitative data were presented as mean \pm standard deviation. Statistical analysis was performed using variation statistics methods. The Student's t-test was applied for comparison of quantitative variables. Correlation analysis was conducted using Pearson's correlation coefficient (r). Differences were considered statistically significant at $p < 0.05$.

Ethical considerations: The study was conducted in accordance with accepted bioethical standards. Informed consent was obtained from parents or legal guardians.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

RESULTS

The analysis of the scientific literature confirmed that the intestinal microbiota is a crucial factor in the development of the child's immune system. Under normal conditions, the microbiota is characterized by sufficient diversity, with Bifidobacterium and Lactobacillus playing a central role in maintaining intestinal barrier function and immune balance [1–4,6].

Our findings demonstrated significant disturbances of intestinal microbiocenosis in frequently ill children (Table 1), characterized by a decrease in beneficial microorganisms and an increase in opportunistic flora.

A reduction in Bifidobacterium was observed in 67.3% of children in the main group compared to 23.3% in the control group ($p < 0.05$). Similarly, decreased levels of Lactobacillus were found in 59.6% versus 20.0%, respectively.

An increased proportion of opportunistic microorganisms (Klebsiella spp., Enterobacter spp., Staphylococcus spp.) was detected in 61.5% of patients in the main group.

The mean frequency of acute respiratory infections was 7.8 ± 1.4 episodes per year in the main group compared to 2.3 ± 0.9 in controls.

Immunological assessment revealed a decrease in secretory IgA (0.74 ± 0.18 g/L vs 1.21 ± 0.24 g/L; $p < 0.05$) and increased levels of IgE (168.4 ± 32.6 IU/mL vs 72.5 ± 18.3 IU/mL) and IL-6 (8.3 ± 2.1 pg/mL vs 3.4 ± 1.2 pg/mL).

Correlation analysis showed:

- negative correlation between Bifidobacterium levels and ARI frequency ($r = -0.62$; $p < 0.05$)
- positive correlation between Lactobacillus and secretory IgA ($r = 0.58$; $p < 0.05$)

These findings indicate a strong association between intestinal microbiota composition and immune status in children.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

DISCUSSION

The obtained results confirm that disturbances in intestinal microbiota in frequently ill children are closely associated with impaired immune function and increased susceptibility to infections.

The observed decrease in Bifidobacterium and Lactobacillus may significantly compromise mucosal immunity, as these microorganisms play a key role in maintaining colonization resistance and regulating immune responses. Their depletion is associated with reduced production of secretory IgA, which represents a critical component of mucosal defense.

The elevated levels of IgE and IL-6 indicate immune system activation and a shift toward a pro-inflammatory state. This imbalance may contribute to a chronic inflammatory response and recurrent infections, forming a vicious cycle that further disrupts microbiota composition.

The identified correlations between microbiota alterations and immune parameters support the concept of bidirectional interaction between the gut microbiome and the immune system. These findings are consistent with the growing body of evidence emphasizing the importance of the gut–lung axis in pediatric respiratory diseases.

Furthermore, early-life microbiota development plays a crucial role in shaping long-term immune competence. Disruptions during this critical window may predispose children to infectious and allergic diseases later in life.

Therefore, strategies aimed at restoring microbial balance—such as probiotics, prebiotics, and dietary interventions—may represent promising approaches for improving immune resilience in frequently ill children.

CONCLUSION

Frequently ill children demonstrate significant alterations in intestinal microbiota, characterized by reduced beneficial microorganisms, increased opportunistic flora, decreased secretory IgA, and elevated IgE and IL-6 levels.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

These changes are associated with a higher frequency of acute respiratory infections and confirm the important role of intestinal microbiota in immune regulation.

Correction of intestinal microbiocenosis may be considered a promising strategy for the prevention and comprehensive management of infectious diseases.

REFERENCES

1. Belkaid Y, Hand TW. Role of the microbiota in immunity and inflammation. *Cell*. 2014;157(1):121–141. doi:10.1016/j.cell.2014.03.011.
2. Hooper LV, Littman DR, Macpherson AJ. Interactions between the microbiota and the immune system. *Science*. 2012;336(6086):1268–1273. doi:10.1126/science.1223490.
3. Wiertsema SP, van Bergenhenegouwen J, Garssen J, Knippels LMJ. The interplay between the gut microbiome and the immune system in the context of infectious diseases throughout life and the role of nutrition in optimizing treatment strategies. *Nutrients*. 2021;13(3):886. doi:10.3390/nu13030886.
4. Levy M, Kolodziejczyk AA, Thaiss CA, Elinav E. Dysbiosis and the immune system. *Nat Rev Immunol*. 2017;17(4):219–232. doi:10.1038/nri.2017.7.
5. Arrieta MC, Stiemsma LT, Amenogbe N, Brown EM, Finlay BB. The intestinal microbiome in early life: health and disease. *Nat Rev Immunol*. 2014;14(8):508–520.
6. Sommer F, Bäckhed F. The gut microbiota—masters of host development and physiology. *Nat Rev Microbiol*. 2013;11(4):227–238. doi:10.1038/nrmicro2974.
7. Hand TW, Reboldi A. Production and function of immunoglobulin A. *Annu Rev Immunol*. 2021;39:695–718. doi:10.1146/annurev-immunol-102119-074236.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

8. Tamburini S, Shen N, Wu HC, Clemente JC. The microbiome in early life: implications for health outcomes. *Nat Med.* 2016;22(7):713–722. doi:10.1038/nm.4142.
9. Hou K, Wu ZX, Chen XY, Wang JQ, Zhang D, Xiao C, et al. Microbiota in health and diseases. *Signal Transduct Target Ther.* 2022;7(1):135. doi:10.1038/s41392-022-00974-4.
10. Peroni DG, Nuzzi G, Trambusti I, Di Cicco ME, Comberiati P. Microbiome composition and its impact on the development of allergic diseases. *Front Immunol.* 2020;11:700. doi:10.3389/fimmu.2020.00700.
11. Pantazi AC, Balasa AL, Mihai CM, Chisnoiu T, Lupu VV, Kassim KMA, et al. Development of gut microbiota in the first 1000 days after birth and potential interventions. *Nutrients.* 2023;15(16):3647. doi:10.3390/nu15163647.
12. Adamczak AM, Werblińska A, Jamka M, Walkowiak J. Maternal–foetal/infant interactions: gut microbiota and immune health. *Biomedicines.* 2024;12(3):490. doi:10.3390/biomedicines12030490.
13. Lynch SV, Pedersen O. The human intestinal microbiome in health and disease. *N Engl J Med.* 2016;375(24):2369–2379. doi:10.1056/NEJMra1600266.
14. Gilbert JA, Blaser MJ, Caporaso JG, Jansson JK, Lynch SV, Knight R. Current understanding of the human microbiome. *Nat Med.* 2018;24(4):392–400. doi:10.1038/nm.4517.
15. Stricker S, Fekonja S, Ralser E, et al. Respiratory and intestinal microbiota in pediatric lung diseases: current evidence of the gut–lung axis. *Int J Mol Sci.* 2022;23(12):6791. doi:10.3390/ijms23126791.
16. Perdijk O, Azzoni R, Marsland BJ. The microbiome: an integral player in immune homeostasis and inflammation in the respiratory tract. *Physiol Rev.* 2024;104(2):835–879. doi:10.1152/physrev.00020.2023.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

17. Garcia-Maurino Alcazar C, Paes VM, Shao Y, Oesser C, Miltz A, Lawley TD, et al. The association between early-life gut microbiota and childhood respiratory diseases: a systematic review. *Lancet Microbe*. 2022;3(11):e867–e880. doi:10.1016/S2666-5247(22)00184-7.
18. Zemanick ET, Rosas-Salazar C. The role of the microbiome in pediatric respiratory diseases. *Clin Chest Med*. 2024;45(3):587–597. doi:10.1016/j.ccm.2024.02.026.
19. Brustad N, Chawes B. Vitamin D primary prevention of respiratory infections and asthma in early childhood: evidence and mechanisms. *J Allergy Clin Immunol Pract*. 2024;12(7):1707–1714. doi:10.1016/j.jaip.2024.02.005.
20. Gold M, Bacharier LB, Hartert TV, Rosas-Salazar C. Use of antibiotics in infancy and asthma in childhood: confounded or causal relationship? A critical review of the literature. *J Allergy Clin Immunol Pract*. 2024;12(10):2669–2677. doi:10.1016/j.jaip.2024.06.018.
21. Li M, Wang M, Donovan SM. Early development of the gut microbiome and immune-mediated childhood disorders. *Semin Reprod Med*. 2014;32(1):74–86. doi:10.1055/s-0033-1361825.
22. Arrieta MC, Stiemsma LT, Dimitriu PA, Thorson L, Russell S, Yurist-Doutsch S, et al. Early infancy microbial and metabolic alterations affect risk of childhood asthma. *Sci Transl Med*. 2015;7(307):307ra152. doi:10.1126/scitranslmed.aab2271.
23. Robertson RC, Manges AR, Finlay BB, Prendergast AJ. The human microbiome and child growth: first 1000 days and beyond. *Trends Microbiol*. 2019;27(2):131–147. doi:10.1016/j.tim.2018.09.008.
24. Milani C, Duranti S, Bottacini F, Casey E, Turrone F, Mahony J, et al. The first microbial colonizers of the human gut: composition, activities, and health implications of the infant gut microbiota. *Microbiol Mol Biol Rev*. 2017;81(4):e00036-17. doi:10.1128/MMBR.00036-17.

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 4, April 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaoa.com/index.php/5>

25. Thursby E, Juge N. Introduction to the human gut microbiota. *Biochem J.* 2017;474(11):1823–1836. doi:10.1042/BCJ20160510.
26. Chang PV, Hao L, Offermanns S, Medzhitov R. The microbial metabolite butyrate regulates intestinal macrophage function via histone deacetylase inhibition. *Proc Natl Acad Sci USA.* 2014;111(6):2247–2252. doi:10.1073/pnas.1322269111.
27. Oh JZ, Ravindran R, Chassaing B, Carvalho FA, Maddur MS, Bower M, et al. TLR5-mediated sensing of gut microbiota is necessary for antibody responses to seasonal influenza vaccination. *Immunity.* 2014;41(3):478–492. doi:10.1016/j.immuni.2014.08.009.
28. Nurmatova NF, Inoyatova FI, Mirsalikova NK. Body sensitization to various antigens in children with chronic hepatitis B and concomitant giardiasis. *Russ J Immunol.* 2020;23(4):493–498.
29. Nurmatova NF. Cytokine gene polymorphism in inflammatory diseases. *Ann Rom Soc Cell Biol.* 2021;25:2330–2346.
30. Akramovich BT, Nurmatova NF. Impact of breastfeeding on the physical and somatic development of children. *Int J Health Sci.* 2022;6(S4):3505–3511.