AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 5. No 12. December ,2025

EARLY-LIFE RISK FACTORS AND PREVENTIVE STRATEGIES FOR ALLERGIC DISEASES IN CHILDREN: CURRENT CHALLENGES AND FUTURE PERSPECTIVES

Murtazayeva Zilola Fakhriddinovna

Lecturer at the Department of Pre-Clinical Sciences,

Asia International University

Abstract: Allergic diseases are among the most common chronic conditions affecting children worldwide, with a steadily rising prevalence over recent decades. Early-life exposures play a critical role in immune system programming and the development of allergic diseases. This article provides an expanded review of early-life risk factors, including nutrition, gut microbiota, environmental influences, and immune immaturity, and discusses evidence-based preventive strategies with an emphasis on future directions in pediatric allergy prevention.

Keywords: pediatric allergy, early-life factors, immune development, prevention, atopic diseases

Introduction

Allergic diseases such as atopic dermatitis, food allergy, allergic rhinitis, and bronchial asthma represent a major public health challenge in pediatrics. The increasing prevalence of these conditions has significant medical, social, and economic implications. Early childhood is a critical window during which environmental and nutritional factors interact with genetic predisposition to shape immune tolerance or allergic sensitization.

Early-Life Immune Development

The neonatal immune system is characterized by functional immaturity and a predominance of Th2-type immune responses. This physiological bias protects the fetus during pregnancy but increases susceptibility to allergic sensitization after birth. Delayed maturation of regulatory T cells and impaired development of immune tolerance mechanisms contribute to allergic inflammation.

Role of Nutrition in Allergy Development

Breastfeeding provides optimal nutrition and immunological protection. Human milk contains bioactive components such as immunoglobulins, cytokines, growth factors, and oligosaccharides that support immune maturation and gut barrier integrity. Numerous studies demonstrate that exclusive breastfeeding reduces the risk of eczema and food allergy, particularly in high-risk infants.

In contrast, early exposure to intact cow's milk proteins may increase allergic sensitization in susceptible children.

Gut Microbiota and Allergy

The infant gut microbiota plays a crucial role in immune regulation. Factors such as cesarean delivery, antibiotic exposure, and formula feeding can disrupt microbiota composition, leading to

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 5. No 12. December ,2025

dysbiosis. Reduced microbial diversity in early life has been consistently associated with the development of allergic diseases.

Environmental Influences

Environmental factors including air pollution, tobacco smoke exposure, urban living, and reduced microbial contact significantly influence allergy risk. The hygiene hypothesis suggests that limited exposure to microorganisms during early life impairs immune tolerance and promotes allergic responses.

Preventive Strategies

Exclusive breastfeeding remains the cornerstone of allergy prevention. When breastfeeding is not possible, the use of extensively hydrolyzed or amino acid-based formulas is recommended for high-risk infants. Timely introduction of complementary foods, including allergenic products, supports oral tolerance development. Probiotic and prebiotic supplementation may offer additional benefits, although further research is required.

Future Perspectives

Advances in genomics, epigenetics, and microbiome research are driving the development of personalized allergy prevention strategies. Early identification of high-risk infants and targeted interventions may significantly reduce the burden of allergic diseases.

Conclusion

Allergic diseases in children result from complex interactions between genetic and early-life environmental factors. Strengthening preventive strategies focused on early nutrition, immune support, and microbiota balance is essential for improving long-term pediatric health outcomes.

References:

1. Prescott SL, West CE. Early-life environmental determinants of allergic diseases. Journal of Allergy and Clinical Immunology. 2019;143(1):1–12.
2. Muraro A, Halken S, Arshad SH, et al. EAACI guidelines on primary prevention of allergic diseases. Allergy. 2014;69(5):590–601.
3. Fiocchi A, Fox A, Dunngalvin A, et al. Food allergy in children: pathophysiology, prevention, and management. Pediatric Allergy and Immunology. 2020;31(Suppl 24):3–13.
4. World Health Organization. Infant and young child feeding: Model chapter for textbooks for medical students and allied health professionals. Geneva: WHO; 2009.
5. Victora CG, Bahl R, Barros AJD, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. The Lancet. 2016;387(10017):475–490.
6. Arrieta MC, Stiemsma LT, Dimitriu PA, et al. Early infancy microbial and metabolic alterations affect risk of childhood asthma. Science Translational Medicine. 2015;7(307):307ra152.
7. Tanaka M, Nakayama J. Development of the gut microbiota in infancy and its impact on health in later life. Allergology International. 2017;66(4):515–522.
8. Strachan DP. Hay fever, hygiene, and household size. BMJ. 1989;299(6710):1259–1260.
9. Sicherer SH, Sampson HA. Food allergy: A review and update on epidemiology, pathogenesis, diagnosis, prevention, and management. Journal of Allergy and Clinical Immunology. 2018;141(1):41–58.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 5. No 12. December ,2025

10. Togias A, Cooper SF, Acebal ML, et al. Addendum guidelines for the prevention of peanut allergy in the United States. Journal of Allergy and Clinical Immunology. 2017;139(1):29–44.
11. Hill DA, Artis D. Intestinal bacteria and the regulation of immune cell homeostasis. Annual Review of Immunology. 2010;28:623–667.
12. Wopereis H, Oozeer R, Knipping K, et al. The first thousand days – intestinal microbiology of early life. Gut Microbes. 2014;5(4):458–470.