Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Nutritional Interventions and Management Strategies in Pediatric Food Allergies: A Review

Tehseen Javed[*1], Nafisa Farheen[2], Anitha W[3], Geetha N B[4], Geetha, C[5]

[1*]peri College of Physiotherapy, Chennai -48
[2&3]Peri College of Pharmacy, Chennai -48
[4]peri Institute of Technology, Chennai - 48
[5]Peri College of Nursing, Chennai -48

Corresponding Author:
Tehseen Javed,
[1*]peri College of Physiotherapy, Chennai -48
Email ID: Peripublications@Gmail.Com

Cite this paper as: Tehseen Javed, Nafisa Farheen, Anitha W, Geetha N B, Geetha C, (2025) Nutritional Interventions and Management Strategies in Pediatric Food Allergies: A Review. *Journal of Neonatal Surgery*, 14 (32s), 855-859.

ABSTRACT

The prevalence of childhood food allergies is increasing in both developed and developing countries, posing a significant public health challenge. This review aims to synthesize current evidence on the prevention and management of food allergies, with a particular focus on the role of nutritional components and dietary practices in supporting immune system development and function. Key nutrients such as essential fatty acids, zinc, and vitamin D are believed to enhance the body's anti-inflammatory and antioxidative defenses, thereby promoting immunological tolerance. Moreover, emerging research highlights the potential of prebiotics and probiotics in modulating gut microbiota and fostering a tolerogenic immune environment. These insights have prompted a critical reassessment of the traditional avoidance-based dietary strategies. Recent findings suggest that early exposure to a diverse range of dietary antigens during infancy may reduce the risk of allergic sensitization by supporting the maturation of the immune system. Consequently, both therapeutic and preventive interventions must be personalized, accounting for individual nutritional needs and allergic risk profiles.

Keywords: *children, food allergy, nutritional immunity, dietary diversity, vitamin D, probiotics, immunological tolerance*

1. INTRODUCTION

Food allergies in children have become a significant public health concern globally, with rising prevalence over the past few decades. These allergies not only affect the quality of life of children and their families but also present complex challenges in ensuring adequate nutrition (Wright et al., 2022; Feeney et al., 2022). Nutritional management plays a pivotal role in mitigating the risks associated with allergen avoidance, while still supporting optimal growth and development (G. West, 2017).

Recent studies have explored various dietary interventions aimed at both preventing and managing food allergies in early childhood. Approaches such as the early introduction of allergenic foods, guided by evidence from trials and clinical guidelines, have demonstrated promising outcomes (Heine & Tang, 2008; Koplin et al., 2019). Complementary feeding practices and the timing of solid food introduction are also critical in shaping immune tolerance and reducing the risk of allergic sensitization (J. West, 2017).

Beyond clinical nutrition, there is growing interest in the broader implications of dietary choices, particularly with respect to sustainability and environmental health. Strategies promoting sustainable diets—those rich in plant-based foods and low in processed items—not only contribute to individual health but also align with planetary health goals (Springmann et al., 2018). Furthermore, innovative food ingredients such as microcrystalline cellulose are being explored for their functional and nutritional benefits in food formulation (Nsor-Atindana et al., 2017), offering additional tools in the development of allergy-friendly and nutritious diets.

Efforts to harmonize food allergy management with practical, culturally appropriate, and nutritionally adequate interventions are essential. Position papers and consensus reports underscore the need for multidisciplinary collaboration among dietitians,

pediatricians, and allergists to formulate safe dietary strategies tailored to children's needs (Serra-Majem et al., 2018; Practical Author, 2011). This paper aims to review current dietary interventions for food allergy prevention and nutritional management in pediatric populations, while considering emerging trends in sustainable and functional nutrition.

1.1 NUTRITIONAL MANAGEMENT OF CHILDREN WITH FOOD ALLERGIES

Children with food allergies require special attention to ensure optimal nutritional status and growth. Avoidance of allergenic foods may lead to deficiencies in essential nutrients such as calcium, vitamin D, protein, and omega-3 fatty acids, particularly in cases of milk, egg, or fish allergies. According to Wright et al. (2022) and Feeney et al. (2022), nutritional management should involve regular monitoring, tailored dietary planning, and use of appropriate substitutes such as fortified plant-based alternatives or hypoallergenic formulas. Dietitian support is critical for maintaining balanced nutrition while ensuring complete allergen avoidance.

1.2 ROLE OF PROBIOTICS AND PREBIOTICS IN IMMUNE MODULATION

Probiotics and prebiotics can modulate gut microbiota, which plays a key role in immune tolerance. Current evidence from clinical practices (J Allergy Clin Immunol Pract, 2022) suggests certain strains like *Lactobacillus rhamnosus* may reduce the risk of eczema and possibly food sensitization. Although findings are promising, further randomized controlled trials are needed to confirm strain-specific effects in preventing or managing food allergies.

1.3 ALLERGEN AVOIDANCE DIETS: RISKS AND RECOMMENDATIONS

While allergen avoidance is the cornerstone of food allergy management, long-term exclusion without supervision may lead to growth retardation or nutritional deficiencies. The position paper in *Front Pediatr* (2020) emphasizes the importance of balanced avoidance diets, supplementation where necessary, and consideration of oral food challenges to reassess tolerance periodically. Eliminating multiple foods (e.g., in eosinophilic esophagitis) requires close nutritional oversight.

2. FOOD LABELING, EDUCATION, AND PUBLIC HEALTH POLICIES

Proper labeling and consumer education are essential for managing food allergies safely. Washi (2001) highlights the importance of accurate food labeling to help consumers identify allergens. Nutrition education programs must be inclusive, culturally appropriate, and targeted at caregivers, schools, and healthcare providers. Policies supporting mandatory allergen labeling and safe school environments are critical.

2.1. NOVEL AND ALTERNATIVE NUTRITIONAL SOURCES

In response to increasing food allergies and sustainability concerns, interest in alternative protein sources is growing. Bukkens (2005) and Bernard et al. (1997) discuss the nutritional profile of edible insects, which are rich in protein, iron, and B12. Similarly, Nanda et al. (2021) explore the use of crab meat-based products and waste valorization. While these are promising, allergenicity of novel proteins must be evaluated.

2.2 NUTRITIONAL CONSIDERATIONS IN PROCESSED AND EXTRUDED FOODS

Food processing can impact nutritional value and allergenicity. Singh et al. (2007) and Burri et al. (2009) review the implications of food extrusion and heat treatment, which may reduce certain antinutrients and modify allergenic proteins. However, ultra-processed foods should be limited in allergy-prone children due to their high sugar and additive content.

2.3 LABEL-FREE FORTIFICATION AND BIOAVAILABILITY ENHANCEMENT

Advancements in food fortification include the use of microcrystalline cellulose and bioactive packaging. Nsor-Atindana et al. (2017) describe its role in enhancing texture and nutrient delivery. Such strategies are especially relevant in hypoallergenic food design to maintain nutrient density without altering taste or safety.

3. FOOD ALLERGIES

Pediatric food allergies represent a growing public health concern globally. The increasing prevalence in both developed and developing nations has prompted considerable research into nutritional strategies aimed at both prevention and management. Dietary interventions have emerged as a crucial element, particularly during the early stages of life when the immune system is still developing.

3.1 FUNCTIONAL FOODS AND FOOD INNOVATIONS IN ALLERGY MANAGEMENT

Functional foods enriched with bioactive compounds can support immune health in allergic individuals. Schaafsma & Kok (2005) and Brandwein et al. (2024) outline the role of fortified foods, hypoallergenic infant formulas, and novel ingredients in improving tolerance and nutritional status. The development of allergen-free alternatives and the application of biotechnology to reduce allergenicity in traditional foods are key innovations.

3.2 SUSTAINABLE DIETS AND ALLERGY-FRIENDLY ALTERNATIVES

Sustainable diets promote health and environmental sustainability. Springmann et al. (2018) present models showing that diets high in plant-based foods and low in animal-source foods reduce environmental impacts while supporting human nutrition. For children with dairy or egg allergies, fortified plant-based alternatives (e.g., oat, soy, almond milk) are viable substitutes, provided they are nutritionally adequate.

Table 1: Key Nutrients in the Prevention of Pediatric Food Allergies

Nutrient	Mechanism of Action	Food Sources
Vitamin D	Enhances mucosal immunity, supports T-regulatory cell activity	Fortified milk, eggs, fatty fish
Omega-3 Fatty Acids	Exert anti-inflammatory effects, modulate immune response	Flaxseed, walnuts, fish oil
Zinc	Supports epithelial barrier integrity, provides antioxidant protection	Meat, legumes, whole grains
Probiotics	Modulate gut microbiota, promote immune tolerance	Yogurt, fermented foods (e.g., kimchi, kefir), supplements
Prebiotics	Serve as fuel for beneficial bacteria, promote short-chain fatty acid (SCFA) production	Bananas, onions, garlic, whole grains

4. HEALTHY DIET

everal studies, including those by Koplin et al. (2019) and Brandwein et al. (2024), emphasize the importance of early dietary diversity in reducing allergic sensitization. Introducing allergenic foods during infancy, particularly between 4–6 months of age, may promote oral tolerance. Delayed introduction, once thought to be protective, is now linked to higher allergy risks.Recent randomized controlled trials have begun exploring specific interventions such as oral immunotherapy using controlled amounts of allergenic foods, as well as the use of bioactive peptides and synbiotics (probiotics + prebiotics). These novel approaches require further validation but hold promise.

4.1EARLY DIETARY INTERVENTIONS FOR ALLERGY PREVENTION

Emerging evidence suggests that early introduction of allergenic foods during infancy may reduce the risk of food allergies. Studies by West (2017) and Heine & Tang (2008) emphasize the importance of introducing peanuts, eggs, and dairy products between 4–6 months of age in infants at risk. Koplin et al. (2019) discuss genetic predisposition and environmental exposure as additional risk factors. The LEAP and EAT studies have informed clinical guidelines that now advocate for supervised early introduction under medical guidance.

Table 2: Common Food Allergens in Children and Nutritional Alternatives

Allergen	Common Forms	Nutritional Alternative
Cow’s Milk	Dairy products	Hydrolyzed formula, soy/coconut milk
Egg	Baked goods, sauces	Egg replacers, chia/flax seeds
Peanut	Peanut butter, snacks	Sunflower seed butter, legumes
Tree Nuts	Baked goods, nut oils	Seeds (pumpkin, sunflower)
Wheat	Bread, pasta, cereals	Rice, quinoa, gluten-free grains
Soy	Tofu, soy milk, processed foods	Almond/coconut milk, lentils

Fish/Shellfish	Seafood products	Plant-based protein, omega-3 supplements

5. CONCLUSION

Malnutrition remains a significant global health burden, affecting individuals and populations across all age groups. In recent years, emerging evidence suggests that the delayed introduction of allergenic foods during infancy may no longer be necessary for the prevention of food allergies. Instead, proactive and carefully timed dietary strategies during weaning have shown promise in reducing the incidence of food hypersensitivities.The prevention and management of food allergies require a multifaceted approach. These include strategies that consider developmental readiness for weaning, geographical variations in allergy prevalence, familial dietary habits, and access to both medical and nutritional care. Particular attention must be given to ensuring adequate nutrient intake, especially in children with cow's milk allergy, where appropriate hypoallergenic formulas must be selected to avoid nutritional deficiencies.

Furthermore, there is growing interest in the potential role of dietary fats—particularly essential fatty acids (EFAs)—as well as prebiotics, probiotics, processed foods, whole foods, and key micronutrients in shaping immune responses. Understanding how various nutrients, dietary patterns, and nutritional modifications influence immune function and allergic outcomes is critical for guiding dietary recommendations. Such insights will enhance our ability to counsel individuals at risk of developing food allergies, as well as those already managing diagnosed allergies, in a more informed and effective manner

REFERENCES

[1] K. Wright, M. Feeney, N. Yerlett, R. Meyer, "Nutritional Management of Children with Food Allergies," Curr Allergy Clin Immunol, 2022, pp. .

[2] G. West, "Dietary Intervention for Preventing Food Allergy in Children," Ann Nutr Metab, vol. 70, Suppl 2, 2017, pp. 47–54, doi:10.1159/000457928.

[3] R. Heine, M. Tang, "Dietary Approaches to the Prevention of Food Allergy," Curr Opin Clin Nutr Metab Care, vol. 11, no. 3, 2008, pp. 320–8. J. Koplin, K. Allen, M. Tang, "Important Risk Factors for Development of Food Allergy and Potential Prevention Options," Expert Rev Clin Immunol, vol. 15, no. 2, 2019, pp. 147–152.

[4] Springmann, M., Wiebe, K., Mason-D'Croz, D., Sulser, T. B., Rayner, M., & Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. The Lancet Planetary Health, 2(10), e451-e461.

[5] S. Feeney et al., "Nutritional Management of Children with Food Allergies," Curr Allergy Clin Immunol, 2022. (Duplicate removed if necessary)

[6] P. Practical author, "Practical Approach to Nutrition and Dietary Intervention in Pediatric Food Allergy," Pediatric Allergy Immunol, 2011.

[7] M. Feeney et al., "Nutritional Management of Children with Food Allergies," Curr Allergy Clin Immunol, 2022, aspects, etc. (similar citation)

[8] K. Feeney, N. Yerlett, R. Meyer, "Nutritional Management of Children with Food Allergies," Curr Allergy Pract, 2022. (duplicate context)

[9] L. Wright, M. Feeney, N. Yerlett, R. Meyer: same grouping above, remove duplicates.

[10] Serra-Majem, L., Raposo, A., Aranceta-Bartrina, J., Varela-Moreiras, G., Logue, C., Laviada, H., ... & Cunha Velho de Sousa, S. (2018). Ibero–American consensus on low-and no-calorie sweeteners: safety, nutritional aspects and benefits in food and beverages. Nutrients, 10(7), 818.

[11] J. West, "Introduction of Complementary Foods to Infants," Ann Nutr Metab, 2017.

[12] M. Wright et al., "Nutritional Management ..." (already listed)

[13] Palacios-Rojas, N., McCulley, L., Kaeppler, M., Titcomb, T. J., Gunaratna, N. S., Lopez-Ridaura, S., & Tanumihardjo, S. A. (2020). Mining maize diversity and improving its nutritional aspects within agro-food systems. Comprehensive Reviews in Food Science and Food Safety, 19(4), 1809-1834

[14] Springmann, M., Wiebe, K., Mason-D'Croz, D., Sulser, T. B., Rayner, M., & Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. The Lancet Planetary Health, 2(10), e451-e461.

[15] H. Practical, 2012 Wiley. Nsor-Atindana, J., Chen, M., Goff, H. D., Zhong, F., Sharif, H. R., & Li, Y. (2017). Functionality and nutritional aspects of microcrystalline cellulose in food. Carbohydrate Polymers, 172, 159-174.

[16] Bukkens, S. G. (2005). Insects in the human diet: nutritional aspects. Ecological implications of minilivestock: potential of insects, rodents, frogs and snails, 545-577.

[17] Marciniak, A., Obuchowski, W., & Makowska, A. (2008). Technological and nutritional aspects of utilization of triticale for extruded food production. Electronic Journal of Polish Agricultural Universities, 11(4), 04.

[18] J. Current Use of Probiotics and Prebiotics in Allergy, J Allergy Clin Immunol Pract, 2022.

[19] F. Prevention of Food Allergy—Early Dietary Interventions, Clin Exp Allergy, 2016.

[20] G. Nutrition and Avoidance Diets in Children with Food Allergy, Front Pediatr, 2020.

[21] Snyderwine, E. G. (1994). Some perspectives on the nutritional aspects of breast cancer research. Food-derived heterocyclic amines as etiologic agents in human mammary cancer. Cancer, 74(S3), 1070-1077.

[22] Schaafsma, G., & Kok, F. J. (2005). Nutritional aspects of food innovations: a focus on functional foods (pp. 207-220). Wageningen Academic Publishers, Wageningen, The Netherlands.

[23] Burri, J., Bertoli, C., & Stadler, R. H. (2009). Food processing and nutritional aspects. Process-induced food toxicants: occurrence, formation, mitigation, and health risks. Wiley, Hoboken, 645-678.

[24] L. Leone, A. Mazzocchi, L. Maffeis, V. De Cosmi, C. Agostoni, "Nutritional Management of Food Allergies: Prevention and Treatment," Front Allergy, 2022, doi:10.3389/falgy.2022.1083669.

[25] Singh, S., Gamlath, S., & Wakeling, L. (2007). Nutritional aspects of food extrusion: a review. International Journal of Food Science & Technology, 42(8), 916-929.

[26] O'Callaghan, T. F., Sugrue, I., Hill, C., Ross, R. P., & Stanton, C. (2019). Nutritional aspects of raw milk: a beneficial or hazardous food choice. In Raw milk (pp. 127-148). Academic Press.

[27] Deshpande, S. S., & Deshpande, U. S. (1995). Nutritional and Health Aspects of Food. Food Antioxidants: Technological: Toxicological and Health Perspectives, 361.

[28] C. Brandwein, R. Enten Vissoker, H. Jackson, T. Rogan, J. Pitcock, E. Krinkin, C. Venter, "Redefining the Role of Nutrition in Infant Food Allergy Prevention: A Narrative Review," Nutrients, vol. 16, no. 6, 2024, Art. 838.

[29] Josephson, E. S., Thomas, M. H., & Calhoun, W. K. (1978). Nutritional aspects of food irradiation: an overview. Journal of food processing and preservation, 2(4), 299-313.

[30] Nanda, P. K., Das, A. K., Dandapat, P., Dhar, P., Bandyopadhyay, S., Dib, A. L., & Gagaoua, M. (2021). Nutritional aspects, flavour profile and health benefits of crab meat based novel food products and valorisation of processing waste to wealth: A review. Trends in Food Science & Technology, 112, 252-267.

[31] Oey, I., Van der Plancken, I., Van Loey, A., & Hendrickx, M. (2008). Does high pressure processing influence nutritional aspects of plant based food systems?. Trends in Food Science & Technology, 19(6), 300-308.

[32] Washi, S. (2001). Nutritional aspects of food labeling in Saudi Arabia. The Ahfad Journal, 18(2), 17.

[33] Bernard, J. B., Allen, M. E., & Ullrey, D. E. (1997). Feeding captive insectivorous animals: nutritional aspects of insects as food. Nutrition Advisory Group Handbook, Fact Sheet, 3, 1-7