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CLINICAL AND IMMUNOLOGICAL FEATURES OF ALLERGIC DISEASES IN PREMATURE INFANTS DEPENDING ON THE TYPE OF FEEDING

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ABSTRACT

Premature birth remains one of the major risk factors for impaired immune maturation, gastrointestinal dysfunction, and early development of allergic diseases in childhood. The type of infant feeding plays an important role in the formation of intestinal microbiota, immune tolerance, and inflammatory response. The aim of this study was to evaluate the clinical and immunological characteristics of allergic diseases in premature infants depending on the type of feeding. A total of 120 infants were included in the study. The main group consisted of 90 premature infants born before 37 weeks of gestation, while the control group included 30 full-term infants. Premature infants were divided into three subgroups according to feeding type: exclusive breastfeeding, formula feeding, and mixed feeding. Clinical manifestations of allergy, including atopic dermatitis, gastrointestinal symptoms, recurrent skin rash, and signs of food intolerance, were assessed. Laboratory parameters included peripheral blood eosinophil count and total serum immunoglobulin E level. The results showed that allergic manifestations were more frequent among formula-fed premature infants compared with breastfed infants. Elevated eosinophil levels and increased total IgE were also more commonly observed in infants receiving artificial feeding. Breastfed premature infants demonstrated a lower frequency of allergic symptoms and a milder clinical course. These findings confirm the protective role of breastfeeding in premature infants and emphasize the need for individualized nutritional support in this high-risk group.

Keywords: premature infants, allergic diseases, breastfeeding, formula feeding, mixed feeding, immunoglobulin E, eosinophilia, pediatrics.

INTRODUCTION

Allergic diseases in early childhood are among the most significant problems in modern pediatrics. Their prevalence has increased in recent decades, especially among children with perinatal risk factors. Premature infants represent a particularly vulnerable group because their immune, digestive, respiratory, and barrier systems are not fully matured at birth. This immaturity creates favorable conditions for abnormal immune responses, intestinal dysbiosis, and increased sensitization to food and environmental allergens.

The neonatal period is a critical stage for the formation of immune tolerance. In full-term infants, this process is supported by adequate maturation of the intestinal mucosa, balanced colonization of the gut microbiota, and passive immune protection received through breast milk. In premature infants, however, these mechanisms are often incomplete. Reduced gestational age, low birth weight, prolonged hospitalization, antibiotic exposure, delayed enteral feeding, and artificial nutrition may negatively influence immune development.

Feeding type is one of the key modifiable factors affecting allergic outcomes in infancy. Breast milk contains immunoglobulins, lactoferrin, cytokines, oligosaccharides, enzymes, growth factors, and living immune cells. These components support intestinal barrier function and contribute to the

development of oral tolerance. Formula feeding, although necessary in certain clinical situations, lacks many biologically active protective factors found in breast milk and may be associated with increased risk of allergic sensitization, especially in premature infants.

Despite numerous studies on childhood allergy, the relationship between feeding type and allergic disease development in premature infants remains insufficiently studied in many clinical settings. This issue is especially important for pediatric practice because early nutritional decisions may influence long-term allergic morbidity.

AIM OF THE STUDY

The aim of this study was to assess the clinical and immunological features of allergic diseases in premature infants depending on the type of feeding.

MATERIALS AND METHODS

The study included 120 infants who were observed in pediatric clinical settings. The main group consisted of 90 premature infants born before 37 completed weeks of gestation. The control group included 30 full-term infants without signs of prematurity.

The premature infants were divided into three subgroups according to the type of feeding: Group I - premature infants receiving exclusive breastfeeding; Group II - premature infants receiving formula feeding; Group III - premature infants receiving mixed feeding.

The inclusion criteria were: gestational age less than 37 weeks for the main group, age corresponding to early infancy, availability of clinical data, and parental consent for clinical observation. The exclusion criteria were severe congenital malformations, hereditary metabolic disorders, primary immunodeficiency conditions, and severe neonatal infections that could independently influence immune parameters.

Clinical assessment included analysis of allergic manifestations such as atopic dermatitis, recurrent skin rash, dry skin, gastrointestinal discomfort, regurgitation, abdominal bloating, unstable stool, mucus in stool, and suspected food intolerance. Particular attention was paid to the onset, duration, severity, and recurrence of symptoms.

Laboratory evaluation included complete blood count with eosinophil assessment and determination of total serum immunoglobulin E. Clinical and laboratory data were compared between feeding groups. The results were analyzed using comparative and descriptive statistical methods.

RESULTS

The analysis showed that premature infants had a higher frequency of allergic manifestations compared with full-term infants. Among premature infants, the most common clinical signs were atopic dermatitis, recurrent erythematous rash, dry skin, intestinal colic, abdominal bloating, and unstable stool.

The lowest frequency of allergic symptoms was observed in the breastfeeding group. In this group, allergic manifestations were usually mild and short-term. Skin symptoms were mainly represented by limited dryness and transient rash. Gastrointestinal symptoms were less pronounced and often resolved without intensive medical intervention.

Formula-fed premature infants had the highest frequency of allergic manifestations. Atopic dermatitis was more persistent in this subgroup, and gastrointestinal symptoms were more common. These infants more often presented with abdominal discomfort, frequent regurgitation, mucus in stool, and signs of food intolerance. In several cases, allergic symptoms required correction of nutrition and additional clinical monitoring.

The mixed-feeding group demonstrated intermediate results. Allergic manifestations were more frequent than in exclusively breastfed infants but less severe than in formula-fed infants. This suggests that even partial breastfeeding may have a protective effect, although it may not fully prevent allergic sensitization in premature infants.

Laboratory findings supported the clinical observations. Eosinophilia was detected more frequently in formula-fed premature infants. Increased total IgE levels were also more common in this subgroup. Breastfed infants had lower rates of eosinophilia and less pronounced IgE elevation. The control group of full-term infants demonstrated the lowest frequency of both clinical allergic manifestations and laboratory signs of allergic sensitization.

These findings indicate that the type of feeding significantly influences the clinical course and immunological profile of allergic diseases in premature infants.

DISCUSSION

The results of the study confirm that prematurity is an important risk factor for the development of allergic diseases in infancy. This may be explained by anatomical and functional immaturity of the intestinal barrier, insufficient production of digestive enzymes, delayed development of immune tolerance, and altered microbial colonization.

The higher frequency of allergic manifestations among formula-fed premature infants may be associated with several mechanisms. First, artificial feeding does not provide the full spectrum of protective bioactive components present in breast milk. Second, formula proteins may act as potential allergens in infants with immature intestinal permeability. Third, formula feeding may influence the composition of gut microbiota, reducing the dominance of beneficial bacteria and increasing the risk of inflammatory immune responses.

Breast milk, on the other hand, contains secretory IgA, human milk oligosaccharides, anti-inflammatory cytokines, and growth factors that promote intestinal maturation. These components help reduce antigen penetration through the intestinal wall and support the formation of immune tolerance. This explains why breastfed premature infants in the study had fewer allergic symptoms and milder clinical manifestations.

The mixed-feeding group showed intermediate results, which is clinically important. It suggests that partial breastfeeding may still provide some immunological benefits. Therefore, even when exclusive breastfeeding is not possible, preservation of breast milk in the infant diet should be encouraged whenever medically feasible.

The increase in eosinophil count and total IgE level among formula-fed infants reflects activation of allergic inflammation. Although total IgE is not always a definitive marker of allergy in early infancy, its elevation together with clinical symptoms and eosinophilia may indicate increased allergic predisposition.

The findings of this study have practical importance for pediatricians, neonatologists, and family doctors. Premature infants should be considered a high-risk group for allergic diseases. Their feeding strategy must be selected individually, with priority given to breastfeeding. When formula feeding is necessary, the choice of formula should be clinically justified, especially in infants with family history of allergy or early signs of food intolerance.

CONCLUSION

Premature infants are at increased risk of developing allergic diseases due to immaturity of the immune and gastrointestinal systems. The type of feeding has a significant influence on the frequency and severity of allergic manifestations.

Formula-fed premature infants demonstrated the highest frequency of allergic symptoms, including atopic dermatitis, recurrent skin rash, gastrointestinal discomfort, and signs of food intolerance. These infants also more frequently had eosinophilia and elevated total IgE levels.

Exclusively breastfed premature infants had a milder clinical course and lower frequency of allergic manifestations. Mixed feeding showed intermediate results, indicating that even partial breastfeeding may contribute to immune protection.

Thus, breastfeeding should be considered an important preventive factor against allergic diseases in premature infants. Early identification of allergic symptoms and individualized nutritional management may reduce the risk of persistent allergic pathology in this vulnerable group.

PRACTICAL RECOMMENDATIONS

1. Premature infants should be monitored as a high-risk group for early allergic manifestations, especially during the first year of life.

2. Exclusive breastfeeding should be recommended whenever possible, as it contributes to intestinal maturation and immune tolerance.

3. If exclusive breastfeeding is not possible, partial breastfeeding should still be preserved because it may reduce the severity of allergic manifestations.

4. Formula feeding in premature infants should be selected individually, taking into account clinical symptoms, family history of allergy, and laboratory markers.

5. Infants with recurrent skin rash, gastrointestinal symptoms, eosinophilia, or elevated IgE should be referred for further pediatric and allergological evaluation.

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